Document

Energy Strategy Report

Project

Highgate Newtown Residential and Community Centre Redevelopment

Client

London Borough of Camden

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REVISION HISTORY

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D5	P1	30-10-2018	Draft for comment	
D5	P2	09-11-2018	With updated calculations	
D5	P3	29-01-2019	Update for revised scheme	
D5	P4	14-02-2020	Updated to revised mechanical system including ASHP	
D5	P5	27-02-2020	Updated to incorporate PM comments	

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APPROVALS

This document requires the following approvals:

Name	Title
Rolfe Jackson	Director

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1.0 EXECUTIVE SUMMARY

This Energy Strategy has been prepared by McBains Ltd for the revised scheme at Highgate Newtown Community Centre in support of the Section 73 Application. The scheme comprises 39 new private dwellings, 2 houses within the refurbished Gospel Hall, and a new community centre. This document supersedes the previous Energy Strategy Report P3 (January 2019).

The Energy Assessment has been updated to incorporate the re-design of the mechanical system which consists in a centralised heat pump system providing heating and domestic hot water to the entire development. This new design solution is being proposed in the form of ASHP, in place of the original CHP system. This was a requirement from the London Borough of Camden to allow for the use of a low carbon technology reducing the carbon footprint of the development and to be in line with the Draft New London Plan (that should be published in March 2020).

In support to incorporating the low carbon technologies, Camden's Sustainability department has confirmed that the assessment should be carried out using SAP 10 carbon factors, in line with the new draft London Plan.

This report has been prepared as part of a series of documents to support the application, in conjunction with which it should be read, and addresses requirements related to energy use and carbon dioxide emissions reduction in accordance with local and national policy. The main policy and guidance context of the responses includes:

- London Borough of Camden – Local Plan (July 2017)
- The London Plan - Minor Alterations to the London Plan (MALP) (March 2016)
- Draft New London Plan (March 2020)

The reduction in regulated carbon dioxide emissions of the proposed site-wide scheme has been estimated as 42% under SAP 10 across the residential and commercial elements from a Part L 2013 compliant baseline by maximising the contribution at each step of the energy hierarchy. This is split down as table 1 below. Having minimised energy demand, a centralised ASHP and a PV array of 24.8 kWp is proposed.

This document sets out how the expected energy demands of the proposed development have been analysed and forms the site-wide energy strategy in accordance with the London Plan's Energy Hierarchy. A summary of key outcomes is provided below:

Be Lean: Energy demand has been minimised through a highly efficient building envelope and systems in terms of U-values and air-tightness, inverter driven pumps, reduced thermal bridges, the inclusion of high efficiency lighting throughout coupled with PIR sensors, occupancy detectors and dimmers. High efficiency heat recovery in the mechanical ventilation system will also be specified. The challenging Target Fabric Energy Efficiency criterion introduced in Part L1A 2013 is complied with across the residential elements of the development.

The overall contribution of lean measures across the site is a 4% savings in carbon dioxide emissions.

The proposed energy efficiency measures to deliver the above performance are summarised below:

- Construction of highly insulated fabric and low air tightness.
- Heat recovery on MVHR (with summer bypass)
- Provision of lamps/luminaires with high efficacy and efficient lighting controls.
- Provision of efficient air source heat pumps (ASHP) systems in non-residential areas
- Provision of PV panels on available roof space.

Be Clean: The new proposed design solution does not include a connection to a District Heating Network nor the installation of an on-site CHP system, and so no carbon reduction is available in this part of the Energy Hierarchy.

Be Green: To further reduce the carbon dioxide emissions of the proposed development, an assessment of potential low and zero carbon technologies has been undertaken. The new proposal would be to use an ASHP providing heating and domestic hot water, as well as installing a PV array (24.8kWp) to contribute towards the electrical load of the development.

The overall contribution of green measures across the site is a further 38% reduction in carbon dioxide emissions.

The development is expected to achieve regulated CO_2 reductions of an estimated 42% compared under SAP 10 as shown below.

Table 1: Site-wide CO_2 Emissions after each stage of the Energy Hierarchy:

Carbon dioxide emissions from proposed measures (tonnes CO_2/annum)	Regulated	Unregulated
Baseline: Part L 2013 compliance	60	34
After Be Lean measures	58	34
After Be Clean measures	58	34
After Be Green measures	35	34

Table 2: Combined Regulated CO_2 savings from each stage of the Energy Hierarchy

Regulated carbon dioxide emissions savings from proposed measures	($tnCO_2$/annum)	(%)
Savings from Be Lean measures	2	4%
Savings from Be Clean measures	0	0%
Savings from Be Green measures	23	38%
Cumulative on-site savings	25	42%

Table 3: Buildings A-D - Residential CO_2 Emissions after each stage of the Energy Hierarchy

Carbon dioxide emissions from proposed measures (tonnes CO_2/annum)	Regulated	Unregulated
Baseline: Part L 2013 compliance	40	23
After Be Lean measures	38	23
After Be Clean measures	38	23
After Be Green measures	22	23

Table 4: Buildings A-D - Residential Regulated CO_2 savings from each stage of the Energy Hierarchy

Regulated carbon dioxide emissions savings from proposed measures	($tnCO_2$/annum)	(%)
Savings from Be Lean measures	2	6%
Savings from Be Clean measures	0	0%
Savings from Be Green measures	15	39%
Cumulative on-site savings	18	45%

Table 5: Building B – Commercial Spaces CO_2 Emissions after each stage of the Energy Hierarchy

Carbon dioxide emissions from proposed measures (tonnes CO_2/annum)	Regulated	Unregulated
Baseline: Part L 2013 compliance	20	11
After Be Lean measures	20	11
After Be Clean measures	20	11
After Be Green measures	13	11

Table 6: Building B – Commercial Spaces Regulated CO_2 savings from each stage of the Energy Hierarchy

Regulated carbon dioxide emissions savings from proposed measures	($tnCO_2$/annum)	(%)
Savings from Be Lean measures	0	0%
Savings from Be Clean measures	0	0%
Savings from Be Green measures	7	36%
Cumulative on-site savings	7	37%

The residential apartments are expected to achieve regulated CO_2 reductions of an estimated 45% compared using the SAP 10 carbon factors. To achieve the "zero – carbon homes" objective, the amount of CO_2 in that needs to be offset is 22 tonnes per year.

The above tables exclude the savings to the residential refurb (Gospel Hall).

In the Gospel Hall refurbished property, by improving U Values to walls and windows and installing high efficiency boilers provides a reduction in CO_2 emissions of 34.8% is achieved against its current emissions.

1.1 Carbon Off Set Payment Residential Buildings A-D

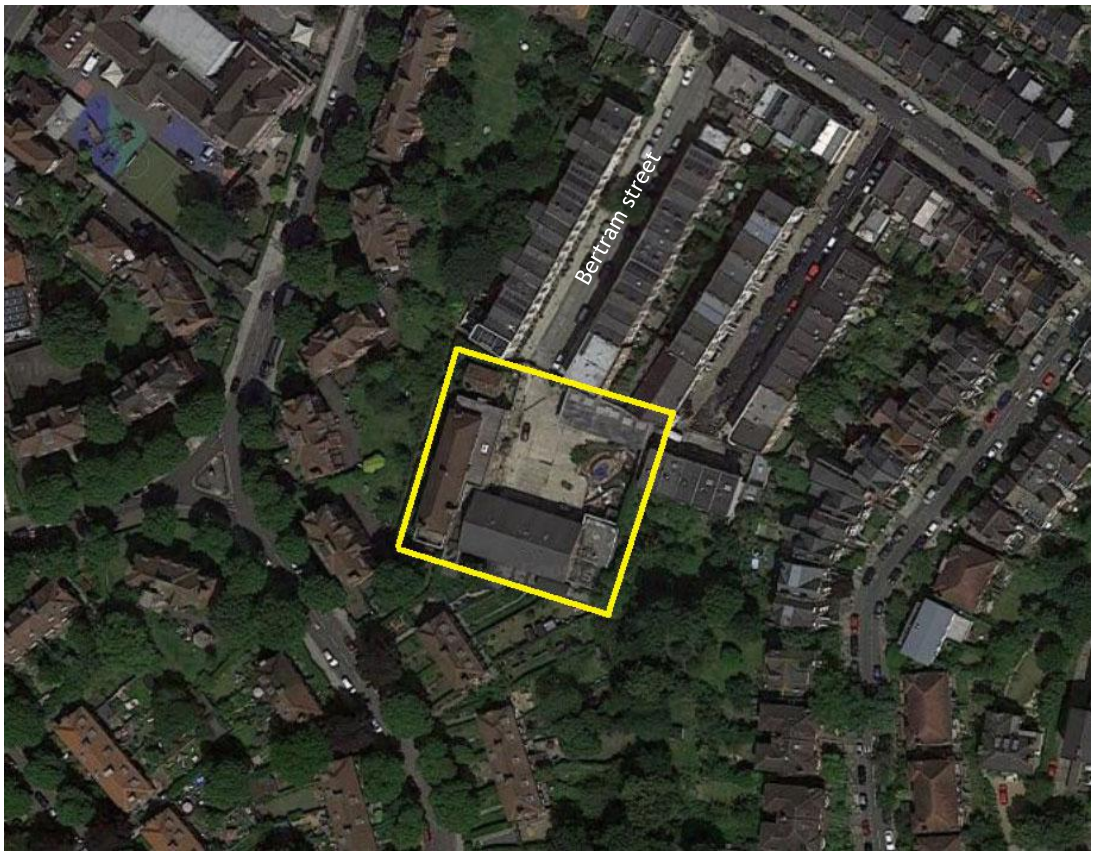
The overall predicted reduction in CO_2 emissions from the Baseline development model (which is Part L 2013 compliant) for Buildings A-D is approximately 45% which represents an annual saving of approximately 18 tonnes of CO_2. To enable the domestic elements to meet their zero carbon reduction targets a one off carbon offset payment of approximately £39,670 will be required in line with the London Plan Policy. This figure is based on a shortfall of approximately 22 tonnes CO_2 per year for a period of 30 years at a rate of £60 / tonne of CO_2.

These calculations are based on SAP 10 carbon factor values.

2.0 INTRODUCTION

The Proposed Development is situated in the London Borough of Camden and it consists in the redevelopment of the Highgate Newtown Community Centre, 25 Bertram Street, London, N19 5DQ. The site is located off Bertram Street and Winscombe Street in a predominantly residential area of Highgate, with the nearest London Underground stations being Archway (1km to the north-east) and Tufnell Park (1km to the south-east). It is currently occupied by Highgate Newtown Community Centre (HNCC) and Fresh Youth Academy, was identified through Camden Council's Community Investment Programme as being in significant need for investment.

The proposals are for the comprehensive redevelopment of the site to provide new a community centre and associated facilities for both the HNCC and FYA and the provision of 39 residential units. The site location is shown in the figure below.



3.0 POLICY REQUIREMENT

The Proposed Development in Old Kent Road has addressed relevant policies and regulations at national, regional and local level as part of this Energy Statement. The relevant policies to this scheme in terms of energy strategy are summarised below:

National level

 	Building Regulations Part L To meet the requirements of the Energy Performance of Buildings Directive 2002/91/EC and 2010/31/EU of the European Parliament and Council on energy efficiency of buildings, the UK government introduced Approved Document L1A (ADL1A) in residential dwellings and Approved Document L2A (ADL2A) in non-domestic buildings. The implementation of Part L1 2013 in April 2014 required meeting the minimum target fabric energy efficiency (TFEE) and targeting emission rates (TER). The implementation of Part L2 2013 in April 2014 required meeting the minimum target emission rates (TER). The documents set minimum standards for the building fabric thermal performance that must be met to minimise energy demand, among other criteria such as limit on solar gain.
	National Planning Policy Framework The National Planning Policy Framework (NPPF) was introduced in 2012 and has superseded all Planning Policy Statements (PPS) and Planning Policy Guidance (PPG) documents, with the exception of PPS10 (Waste). The NPPF sets out the Government's strategy on the delivery of sustainable development through the planning system in a more simplified approach.

Regional and Local levels

The local policies reviewed include the following

- London Plan - (March 2016)
- New Draft London Plan (it should be published in March 2020)
- GLA Revised Sustainable Design & Construction SPG (April 2014)
- GLA guidance on preparing energy assessments (April 2015)
- London Borough of Camden – Camden Local Plan (2017)

The London Plan (March 2016)

The London Plan sets out the overall strategic plan for London's development, providing an integrated economic, environmental, transport and social framework for the development of London over the next 20–25 years. The London Plan sets the strategic planning structure for all major developments in London. Some energy related key policies stated in the plan are summarised below.

Policy 5.2 Minimising carbon dioxide emissions:

5.2A - Development proposals should make the fullest contribution to minimising carbon dioxide emissions in accordance with the following energy hierarchy:

- Be lean: use less energy
- Be clean: supply energy efficiently
- Be green: use renewable energy

5.2B - The Mayor will work with boroughs and developers to ensure that major developments meet required CO_2 reduction of 35% against building regulations 2013 target emission rate.

5.2C - Major development proposals should include a detailed energy assessment to demonstrate how the targets for carbon dioxide emissions reduction outlined above are to be met within the framework of the energy hierarchy.

5.6C - Potential opportunities to meet the priority in this hierarchy are outlined in the London Heat Map tool. Where future network opportunities are identified, proposals should be designed to connect to these networks.

Policy 5.7 Renewable energy:

5.7B - Within the framework of the energy hierarchy, major development proposals should provide a reduction in expected carbon dioxide emissions using on-site renewable energy generation, where feasible.

Policy 5.9 Overheating and cooling:

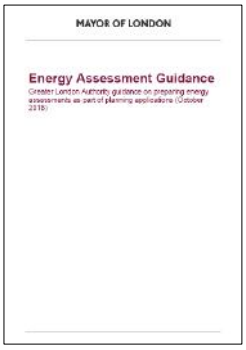
5.9B - Major development proposals should reduce potential overheating and reliance on air conditioning systems and demonstrate this in accordance with the following cooling hierarchy:

- minimise internal heat generation through energy efficient design
- reduce the amount of heat entering a building in summer through orientation, shading, albedo, fenestration, insulation and green roofs and walls
- manage the heat within the building through exposed internal thermal mass and high ceilings
- passive ventilation

- mechanical ventilation
- active cooling systems (ensuring they are the lowest carbon options).

5.9C - Major development proposals should demonstrate how the design, materials, construction and operation of the development would minimise overheating and meet its cooling needs. New development in London should also be designed to avoid the need for energy intensive air conditioning systems as much as possible

GLA Guidance on Planning Energy Assessment (April 2016)



Although primarily aimed at strategic planning applications, London Boroughs are encouraged to apply this strategy for energy assessments related to non-referable applications and adapt it for relevant scales of development.

This guidance note provides further detail on how to prepare an energy assessment to accompany strategic planning applications as set out in London Plan Policy 5.2. The purpose of an energy assessment is to demonstrate that climate change mitigation measures comply with London Plan energy policies, including the energy hierarchy. It also ensures energy remains an integral part of the development's design and evolution.

Policy 5.2 of the London Plan states that from 2013 to 2016 energy assessments should be produced to meet a target of 40 per cent carbon reduction beyond Part L 2010 of the Building Regulations. This requirement has been applied to Stage 1 applications received by the Mayor since 1 October 2013. This reduction in CO_2 emissions affected the percentage reduction necessary above the Part L 2013 regulations to meet the Mayor's targets in the London Plan.

As outlined in the Sustainable, Design and Construction SPG, since 6 April 2014, up until 30 Sept 2016, the Mayor has applied a 35% carbon reduction target beyond Part L 2013 of the Building Regulations - this is deemed to be broadly equivalent to the 40% target beyond Part L 2010 of the Building Regulations, as specified in Policy 5.2 of the London Plan for 2013-2016. The 35% target is a flat percentage reduction across both residential and non-domestic buildings.

After 1 Oct 2016 "Zero carbon" homes will be the target for major development where residential elements of the application achieves at least 35% CO2 reduction in regulated emissions beyond Part L1A 2013. The remaining regulated carbon dioxide emissions, to 100 per cent, are to be off-set through cash in lieu contribution to the relevant borough to secure the delivery of carbon dioxide savings elsewhere (in line with policy 5.2E).

Grid electricity has significantly decarbonised since the last update of Part L in April 2014 and in July 2018 the Government published updated carbon emissions factors (SAP 10) demonstrating this. The impact of these new emissions factors is significant in that technologies generating on-site electricity (such as gas-engine CHP and solar PV) will not achieve the carbon savings they have to date.

From January 2019 planning applications are encouraged to use the SAP 10 emissions factors in referable applications when estimating CO2 emission performance against London Plan policies.

4.0 METHODOLOGY

4.1 The Accredited Software

In order to determine the baseline consumption and improvements in the private residential dwellings, a series of Standard Assessment Procedure (SAP) assessments were carried out. A representative sample of 22 dwellings (more than 50% of the total number of residential units) was selected to show a range of compliance strategies and potential improvements. For this exercise the Stroma FSAP 2012 Calculator Version 1.0.4.16 was used, which is a government accredited software package (checked by BRE on behalf of DECC, CLG, SBS and DFPNI).

In order to develop the Simplified Building Energy Model (SBEM) for the non-domestic elements of the development, for this calculation Tas v9.4.4 has been used. This is a Dynamic Simulation Modeller which gives a highly accurate representation of the building energy use, calculating the building demand, consumption and CO_2 emissions for every hour of the year. This version of the software has been accredited by the CLG for Part L2a & production of EPC certificates for all levels of buildings.

4.2 SAP 10 Carbon Emission Factors

From January 2019, to be in line with the draft new London Plan, applicants are encouraged to use the updated SAP 10 emission factors. The Energy Assessment is undertaken using the SAP 10 carbon factors, as confirmed by the Camden's Sustainability department.

4.3 The Approach

Once the Part L 2013 calculations had been set up according to the information from the rest of the design team, the energy hierarchy was applied as described in London Plan Policy 5.2 Minimising carbon dioxide emissions;

- Be lean: Use less energy
- Be clean: Supply energy efficiently
- Be green: Use renewable energy

The Baseline: The Building/Dwelling Emission Rate (BER/DER) of the development and the Target Emission Rates (TER) of the corresponding notional buildings were calculated using SBEM and SAP in accordance with Building Regulations Part L 2013. For the residential element of the development, SAP calculations were undertaken in order to establish an overall figure for the Dwelling Emission Rate (DER) across the residential element of the development. Similarly, full SBEM simulations were carried out for the community centre to estimate the associated energy demand and regulated carbon dioxide emissions.

The Energy Hierarchy: Once the baselines were determined, the energy hierarchy was applied to maximise the reduction of carbon dioxide emissions; energy efficiency measures first, followed by an assessment of the options for meeting the remaining energy demand efficiently and finally an assessment of the options to further reduce carbon dioxide emissions from renewable energy generated onsite.

5.0 THE BASELINE

To assess the performance of the residential element of the development, the following parameters summarised in Table 3 were applied to the representative sample dwellings.

Table 3: NEW RESIDENTIAL - Fabric and services parameters

Element or system	Units	Highgate Newtown	Notional building (Part L1A 2013)	Limiting Values (Part 1a 2013)
FABRIC PERFORMANCE				
Ground Floor - U value	W/m²K	0.11	0.13	0.25
External Walls - U value	W/m²K	Block A 0.15 Block D 0.18	0.18	0.3
Party walls - U value	W/m²K	0	0	0.2
Roof - U value	W/m²K	Block A 0.11 Block D 0.13	0.13	0.25
Windows, rooflights, glazed doors				
U value	W/m²K	1.4	1.4	2
g value		0.37 Flats	0.63	-
frame factor		varies		
External Doors		1.4	1	
Air tightness	m³/hr/m	3	5	10
Thermal bridging (y factor)		Accredited Construction		
BUILDING SERVICES				
ASHP SCOP	-	3.7		
Fraction of heating load	%	46%		
Boiler efficiency	%	93.9	89.5	
Fraction of heating load	%	54		
Energy efficient lighting	%	100	100	100
Mechanical ventilation & heat recovery: Specific Fan Power	W / L / s	SFP = 0.53 / 94%		
Mechanical cooling SEER		None		

Table 3: EXISTING BUILDING RESIDENTIAL - Fabric and services parameters

Element or system	Units	Existing Building (Part L1B 2013)	Improved U Values
FABRIC PERFORMANCE			
Ground Floor - U value	W/m²K	0.6	0.6
External Walls - U value	W/m²K	2.2	1.8
Party walls - U value	W/m²K	0	0
Roof - U value	W/m²K	2.5	0.18
Windows, rooflights, glazed doors			
U value	W/m²K	5.6	1.4
g value			0.44 - 0.558
Air tightness	m³/hr/m²	15	10
BUILDING SERVICES			
Boiler efficiency	%	n/a	91%)
Energy efficient lighting	%	n/a	100
Mechanical ventilation & heat recovery: Specific Fan Power (SFP) / heat	W / L / s	n/a	SFP = 0.53 / 94%
Mechanical cooling SEER		None	None

Table 4: NON DOMESTIC - Fabric and services parameters

Element or system	Units	Highgate Newtown	Notional building (Part L2A 2013)	Limiting Values (Part 1a 2013)
FABRIC PERFORMANCE				
External Walls - U value	W/m²K	0.22	0.26	0.35
Ground Floor - U value	W/m²K	0.11	0.22	0.25
Ground Floor Hall - U value	W/m²K	0.18	0.22	0.25
Roof - U value	W/m²K	0.14	0.22	0.25
Roof Hall - U value	W/m²K	0.18	0.22	0.25
Windows, rooflights, glazed doors				
U value	W/m²K	1.5	1.4	2.2
g value		0.32	0.63	-
frame factor		0.8		
External Doors (entrance)		1.5		
Air tightness	m³/hr/m²	3	3	10
BUILDING SERVICES				
ASHP SCOP	-	3.7		
Fraction of heating load	%	46%		
Boiler efficiency	%	93.9	91	
Fraction of heating load	%	54		
Lighting (lm/W)	%	100	60	60
Mechanical ventilation & heat recovery: Specific Fan Power (SFP) / heat recovery efficiency	W / L / s	varies (refer to mechanical specification)		
Mechanical cooling SEER			5.44	

5.1 Percentage of Glazed Area of the Façade

The percentage of glazing to the façade of each building is detailed as below:

Building A New Build Residential	29.5%
Building B New Build Community Centre	15.4%
Building C Existing Building	17.3%
Building D New Build Residential	24%

6.0 IMPROVEMENTS FROM REDUCING ENERGY DEMAND ('BE LEAN')

Reducing carbon emissions from the total energy needs (heating, cooling and power) of the development is one of the fundamental aims of any development adopting the principles of sustainable design in order to mitigate the effects of climate change and help conserve fossil fuel resources.

The first step in the energy hierarchy is to use passive design and energy efficiency measures to reduce the energy demand of the building. From preliminary calculations, it is estimated that a regulated carbon dioxide emissions reduction of 6% over Part L 2013 across the development as a whole through lean measures alone can be achieved. It is worth noting that the challenging Target Fabric Energy Efficiency criterion has been achieved in all of the sample dwellings and on a block basis this criterion is passed.

A. Building Fabric Improvements and Overheating

The glazed areas in the residential element of the scheme are a key component. The proportion of glazing to façade area was assessed with careful consideration of beneficial heat gain, winter heat losses, daylight and aesthetic appeal of the building. Windows with a U-value of 1.40 W/m^2K are proposed. This will help to minimise excessive heat loss in winter and solar gain in the summer, reducing the associated heating load in winter and the risk of overheating in summer. Furthermore, external wall U-values of 0.15 – 0.22 W/m^2K have been selected for the new residential & commercial buildings.

B. Air Tightness Improvements

An improvement upon the minimum requirements of the Part L 2013 will be targeted with $3m^3/m^2$hour at 50 Pa pressure. The Design Team and Contractor will incorporate suitable construction details into the design and adopt best practice construction practices in order to achieve these figures.

C. Thermal Bridging

Thermal bridging will be carefully considered to improve upon the minimum default y value of 0.15. Thermal bridges at all window junctions (sills, jambs and lintels) will be designed with Accredited Construction Details to ensure that heat transferred through to the building is reduced. Particular attention will also be paid to the balconies, which are one of the highest risk areas to cause thermal bridging due to construction methods and detailing.

D. Luminaires and Controls

Low energy lighting has become an essential feature of building design. Advances in lamp and ballast design have led to higher efficiency luminaires with control measures having become standard in most new developments in order to respond to changes to standards such as Part L of the Building Regulations and sustainability assessment methods such as BREEAM and the Code for Sustainable Homes.

Lighting controls can consist of simple presence detection which when combined with daylight control can switch luminaires on/off automatically or regulate the lighting levels in accordance with the outside conditions. These systems are proposed for use in conjunction with each other for the most energy efficient installation. Daylight control is intended for use to control external lighting.

Energy efficient light fittings will be provided throughout the development to reduce the electrical load. Daylight sensors and timers will be installed to all external lighting (not including security lighting). High efficiency lamps will be installed in communal areas managed by the landlord. These will be controlled by a combination of infrared occupancy control.

E. Ventilation

Due to the high performance of the building fabric and the development, relying solely on natural ventilation for the residential dwellings is not considered an appropriate strategy and a balanced mechanical ventilation strategy with mechanical extract is proposed. This will ensure minimum fresh air requirements, moisture and odour removal from the kitchen and toilet areas and allow for a boost / purge facility to increase the volume of air flow controlled. In order to optimise the energy performance of the system, each unit will incorporate heat recovery.

For the community centre, a natural ventilation strategy is proposed. Given that the building is on multiple floors and based around a central atrium with large open spaces, the opportunity exists to adopt this operational strategy.

F. Comfort Cooling

The controlled ventilation strategies and high performance fabric within both the residential dwellings and community centre assume that comfort cooling will not be required. Likewise, both buildings will be provided with openable windows, and a summertime boost function on the MVHR (mechanical ventilation unit) will allow the occupants choice as to how to regulate the internal comfort within the apartment blocks.

It should be noted that no internal blinds are assumed for all dwellings.

The table below demonstrates how the development has addressed the issue of cooling in line with Cooling Hierarchy as included within Policy 5.2 of the Minor Alterations to the London Plan (MALP) (March 2016).

Cooling hierarchy	Proposed Development
1 minimise internal heat generation through energy efficient design	Selection of high performance glazing units with U values and g- values that exceed Part L 2013 requirements.
2 reduce the amount of heat entering a building in summer through orientation, shading, albedo, fenestration, insulation and green roofs and walls	In terms of external shading, window reveals and a significant quantum of logias (recessed balconies) substantially reduce excessive solar gains. Areas of green roofs are also being considered in combination with the roof mounted PV arrays.
3 manage the heat within the building through exposed internal thermal mass and high ceilings	An ample floor -ceiling height of 2.5m is provided. A night-time cooling strategy via openable windows or rooflights is proposed to allow the structure of the buildings to cool down Community Centre only.
4 passive ventilation	Openable windows are provided to all dwellings and the community centre allow users control over their environment
5 mechanical ventilation	Mechanical ventilation with heat recovery is to be installed in all dwellings, with a summertime boost function.
6 active cooling systems (ensuring they are the lowest carbon options).	A in depth overheating analysis has been undertaken for both the community centre and the residential buildings which has highlighted the following issues Residential – TM59 There are a number of south facing bedrooms and living rooms currently failing the TM59 assessment. Currently the analysis has been carried out excluding blinds and the analysis will be run using blinds to confirm any overheating areas. A review is ongoing on how these issues can be mitigated and resolved, trying to avoid any cooling being installed. Commercial – TM52 The community centre currently passes the TM52 analysis as detailed in the results shown in appendix D. During the stage 4 design the scheme, looking at window openings and louvre openings. The results of the TM52 and TM59 thermal models can be seen in Appendix D.

7.0 IMPROVEMENT FROM SUPPLYING ENERGY EFFICIENTLY ('BE CLEAN')

7.1 District Heating Network

In accordance with GLA Energy Assessment Guidance (2018) and draft London Plan Policy SI3, the energy systems for the site have been determined in accordance with the following hierarchy:

1. Connection to existing low carbon heat distribution networks
2. Use zero emission or local secondary heat sources (in conjunction with heat pump if required)
3. Use low-emission combined heat and power (CHP)
4. Use ultra low NOx gas boilers

Although not indicated on the London Heat Map below, existing heating networks exist in close proximity and are under London Borough of Camden's ownership. These are Highgate Newtown and Brookfield. However, it is our understanding that these networks are both refurbishments and the respective plant rooms do not include sufficient capacity to extend the networks to service the Highgate Newtown Community Centre.

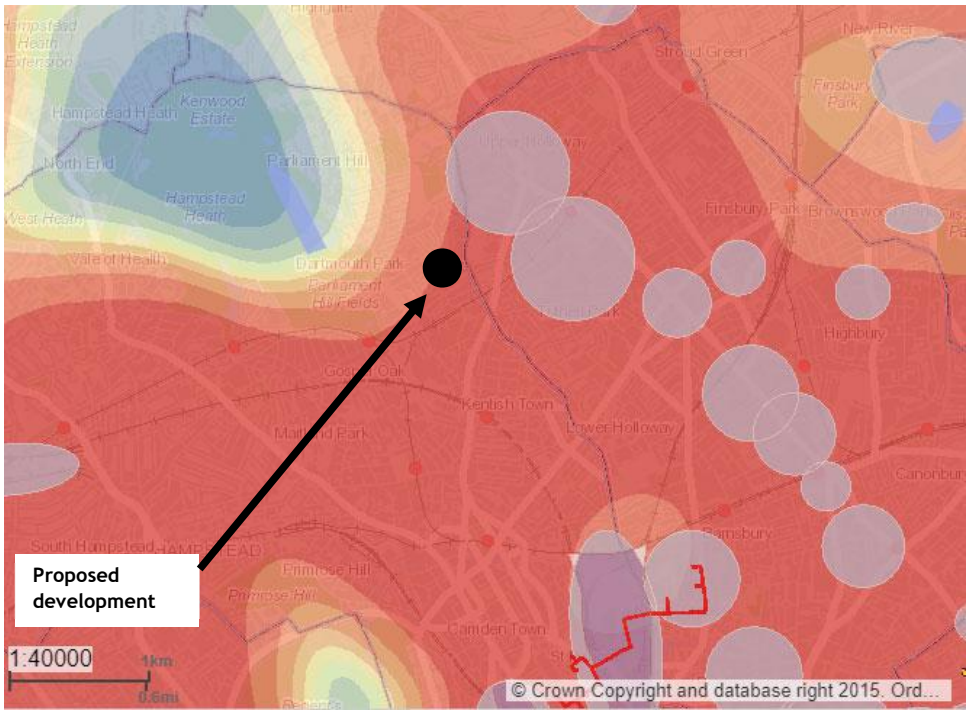


Figure 1: London Heat Map showing heat loads and district heating networks in the vicinity of the proposed development.

7.2 Combined Heat and Power (CHP)

Connecting to a District Heating Network was the first option assessed. As no suitable heat network currently exists, nor plans confirmed in terms of future network routes, the next solution that was assessed was to install a Combined Heat and Power (CHP) unit.

The inclusion of a centralised CHP plant was developed and proposed within the previous energy assessment. However, as described in the Executive Summary, the energy strategy has been amended at this stage to be in line with the new draft London Plan which encourage the use of heat pumps and low-emissions technologies. For that reason the heating strategy for all the building has been reviewed and the CHP system not included.

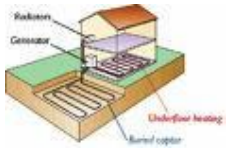
As such no benefit in terms of carbon dioxide reduction are offered in this part of the Energy Hierarchy.

8.0 IMPROVEMENT FROM INTRODUCING RENEWABLE ENERGY TECHNOLOGIES ('BE GREEN')

8.1 Initial feasibility

A renewable and low carbon technology feasibility study has been carried out to investigate the contribution that on-site generation from renewable energy technologies could make to further reduce the carbon dioxide emissions in the proposed development. The following technologies have been assessed in terms of their technical feasibility and potential CO_2 emissions savings:

- Solar thermal water heating;
- Photovoltaics;
- Biomass heating;
- Building mounted and stand-alone wind turbines;
- Ground source heat pumps (GSHP); and
- Air source heat pumps (ASHP).

Technology	Feasibility	Comments
Ground Source Heat Pumps 	✗	Ground source heat pumps extract heat from the ground and convert it to low grade heat for space heating and hot water. A ground source heat pump requires a large ground array, which would not fit on this site. Also, the cost of installing bore holes or slinky installations can still be prohibitively expensive. Heat Pumps typically meet a proportion of the heating and cooling loads and can be incorporated into the piles of a building structure. However, optimum performance is yielded when both heating and cooling are provided as this ensures that over the long term, the temperature of the ground remains relatively constant over a typical year. Mechanical cooling is not proposed for any of the dwellings and for a few spaces in building B, so a long-term temperature regime, and therefore optimal performance of a heat pump system could not be guaranteed. The technology is therefore discounted.
Air Source Heat Pumps 	✓	Air source heat pumps extract heat from the air and convert it to low grade heat for space heating. These will produce low-grade heat which can then be boosted by the gas boilers to provide higher grade heat to the site-wide heat loop. This combination offers the best efficiency given the constraints of the site.

Technology	Feasibility	Comments
Photovoltaics 	✔	The proposed development has a large area of flat or south facing roof and thus with the appropriate mounting systems can be very favourable for the installation of Photovoltaic panels. Photovoltaic cells would contribute to a proportion of the electrical load of the scheme and also benefit from the Feed in Tariff.
Solar Hot Water Systems 	✘	The hot water load is substantial in any residential scheme. In this case this has been addressed at the second step of the energy hierarchy through the Combined Heat and Power plant; therefore, the solar thermal technology would not make a further contribution to the carbon dioxide emissions reduction and will not be considered further.
Biomass Heating 	✘	A communal biomass boiler would be unsuitable for the development due to its central London location and the associated implications of fuel deliveries. Furthermore, given the restricted space between buildings and regular pedestrian movements related to the Community Centre, fuel deliveries from large vehicles would be deemed to pose a significant safety risk. This will not be further considered.

Technology	Feasibility	Comments
Wind (roof mounted) 	✗	Roof mounted wind turbines are not recommended for this site due to noise, flicker and vibration implications on the residential/non-domestic areas. Numerous inner city wind turbine trials have shown that such turbines' energy yields are significantly lower than manufacturers' estimations. This will not be further considered.
Wind (standalone) 	✗	Small-scale (10m mast), standalone turbines are not suitable for this development due to lack of space on the site and relatively low wind speeds that would be achieved in this very urban environment. This will not be further considered.

8.2 Preferred Options for Renewables

As the proposed development will not include structural piles, a ground source heat pump system is not proposed. Air Source Heat Pumps have been considered the ideal technology to serve this site. The ASHP system will supply both heating and domestic hot water to all the buildings. External units could be located on the top roof area. Where higher flow temperatures are required for DHW production this will be met with ultra-low NOx gas boilers.

Space is available at roof level to install a PV array, then this renewable technology has been proposed. A 99 panel PV array is installed which will equate to 24.8 kWp, with active area of approximately 160m^2. Please refer to Appendix A for an indicative PV layout.

Indicative details of the PV panels are listed below:

Solar PV Information Required		Units
Model	Sanyo HIT-H250E01	
Efficiency	18	%
Number of PV panels	99	
Area of PV panels	160	m^2
Total Capacity (Installed Power)	24.75	kWp
Total Energy Output	17,325	kWh/year
CO_2 Offset	8.9	kgCO_2
Emissions Reductions	17.1	%
Additionally, FiT information can be provided	It should be noted that on 19th July 2018 the Department of Business Energy and Industrial Strategy (BEIS) published a consultation in which they state their intention to close the FIT scheme to new applicants from 1 April 2019.	

APPENDIX A - PROPOSED PV LAYOUT

Proposed PV Layout

APPENDIX B1 - SAP OUTPUTS FOR SAMPLE UNITS "LEAN"

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	A-0-01	**Issued on Date**	05/02/2020
Assessment Reference	ASHP - Be Lean	**Prop Type Ref**	2bed 3F
Property			

SAP Rating	84 B	**DER**	16.14	**TER**	16.84
Environmental	88 B	**% DER<TER**	4.16		
CO_2 Emissions (t/year)	0.97	**DFEE**	43.85	**TFEE**	47.91
General Requirements Compliance	Fail	**% DFEE<TFEE**	8.48		

Assessor Details	Miss Claudia Cioli, Claudia Cioli, Tel: 07481524839, clacioli@gmail.com	**Assessor ID**	R479-0001
Client			

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

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DWELLING AS DESIGNED

Ground-floor flat, total floor area 74 m²

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

1a TER and DER
Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 16.84 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 16.14 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)47.9 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)43.8 kWh/m²/yrOK

---
2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.11 (max. 0.25)	0.11 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.34 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction

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

---
4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage Measured cylinder loss: 0.74 kWh/day
Permitted by DBSCG 0.32 Fail
Primary pipework insulated: No primary pipework

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

Hot water controls: No cylinderstat

---
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: 94%
Minimum: 70% OK

---
9 Summertime temperature
Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing North East: 3.35 m², No overhang
Windows facing West: 15.10 m², Overhang width less than twice window, ratio 1.00
Air change rate: 0.50 ach
Blinds/curtains: None

---
10 Key features
Party wall U-value 0.00 W/m²K
Floor U-value 0.11 W/m²K
Air permeability 3.0 m³/m²h

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	74.0000 (1b)	x	2.5400 (2b)	=	187.9600	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	187.9600	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							0 * 10 =	0.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.0000	
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	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) =	79.9000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2631	0.2599	0.2567	0.2408	0.2376	0.2216	0.2216	0.2184	0.2280	0.2376	0.2439	0.2503	(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	
W03 (Uw = 1.25)			8.4000	1.1905	10.0000			(27)
door			2.1000	1.4000	2.9400			(26a)
W01 (Uw = 1.40)			10.0500	1.3258	13.3239			(27)
Heat Loss Floor 1			74.0000	0.1100	8.1400	110.0000	8140.0000	(28a)
External Wall 1	49.5300	20.5500	28.9800	0.1500	4.3470	140.0000	4057.2000	(29a)
Total net area of external elements Aum(A, m2)			123.5300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		38.7509			(33)
Party Wall 1			42.5000	0.0000	0.0000	140.0000	5950.0000	(32)
Party Ceilings			74.0000			80.0000	5920.0000	(32b)
Internal Wall			132.0000			9.0000	1188.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 25255.2000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	341.2865	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	7.7649	(36)
Total fabric heat loss	(33) + (36) = 46.5158	(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	16.3169	16.1192	15.9215	14.9330	14.7352	13.7467	13.7467	13.5490	14.1421	14.7352	15.1307	15.5261	(38)
Heat transfer coeff	62.8327	62.6350	62.4373	61.4487	61.2510	60.2625	60.2625	60.0647	60.6579	61.2510	61.6464	62.0418	(39)
Average = Sum(39)m / 12 =												61.3993	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8491	0.8464	0.8437	0.8304	0.8277	0.8144	0.8144	0.8117	0.8197	0.8277	0.8331	0.8384	(40)
HLP (average)												0.8297	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.3392	(42)
Average daily hot water use (litres/day)	94.4799	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	103.9278	100.1486	96.3694	92.5903	88.8111	85.0319	85.0319	88.8111	92.5903	96.3694	100.1486	103.9278	(44)
Energy conte	154.1220	134.7961	139.0975	121.2685	116.3601	100.4099	93.0445	106.7699	108.0451	125.9162	137.4473	149.2589	(45)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy content (annual)												Total = Sum(45)m =	1486.5360 (45)
Distribution loss (46)m = 0.15 x (45)m													
	23.1183	20.2194	20.8646	18.1903	17.4540	15.0615	13.9567	16.0155	16.2068	18.8874	20.6171	22.3888	(46)
Water storage loss:													
Store volume													2.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													0.7400 (48)
Temperature factor from Table 2b													1.0000 (49)
Enter (49) or (54) in (55)													0.7400 (55)
Total storage loss													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(56)
If cylinder contains dedicated solar storage													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	200.3244	176.5273	185.2999	165.9805	162.5625	145.1219	139.2469	152.9723	152.7571	172.1186	182.1593	195.4613	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
											Solar input (sum of months) = Sum(63)m =		0.0000 (63)
Output from w/h													
	200.3244	176.5273	185.2999	165.9805	162.5625	145.1219	139.2469	152.9723	152.7571	172.1186	182.1593	195.4613	(64)
											Total per year (kWh/year) = Sum(64)m =		2030.5320 (64)
Heat gains from water heating, kWh/month													
	88.2075	78.2047	83.2118	76.0914	75.6516	69.1559	67.8992	72.4629	71.6946	78.8290	81.4708	86.5905	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	18.4049	16.3471	13.2943	10.0647	7.5235	6.3516	6.8632	8.9210	11.9737	15.2034	17.7446	18.9165	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	206.4473	208.5895	203.1911	191.6984	177.1909	163.5559	154.4469	152.3047	157.7031	169.1958	183.7033	197.3383	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	(71)
Water heating gains (Table 5)													
	118.5584	116.3760	111.8439	105.6825	101.6823	96.0498	91.2624	97.3964	99.5758	105.9530	113.1539	116.3851	(72)
Total internal gains													
	401.4985	399.4005	386.4172	365.5335	344.4846	324.0453	310.6604	316.7100	327.3406	348.4402	372.6898	390.7277	(73)

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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	8.4000	19.6403	0.3700	0.8900	0.7700	37.6488	(80)
Northeast	3.5000	11.2829	0.3700	0.6500	0.7700	6.2996	(75)
West	6.7000	19.6403	0.3700	0.6500	0.7700	21.9316	(80)

Solar gains	65.8801	129.3751	215.0477	317.8816	394.0780	405.5728	385.2214	327.7574	251.3909	153.9696	82.2164	54.1407	(83)
Total gains	467.3786	528.7756	601.4648	683.4151	738.5626	729.6182	695.8818	644.4673	578.7315	502.4097	454.9061	444.8684	(84)

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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	111.6510	112.0034	112.3581	114.1657	114.5342	116.4130	116.4130	116.7962	115.6541	114.5342	113.7995	113.0742	
alpha	8.4434	8.4669	8.4905	8.6110	8.6356	8.7609	8.7609	8.7864	8.7103	8.6356	8.5866	8.5383	
util living area													
	0.9994	0.9980	0.9894	0.9295	0.7509	0.5277	0.3810	0.4286	0.7108	0.9697	0.9980	0.9996	(86)
MIT	20.4011	20.5053	20.6806	20.8883	20.9845	20.9993	21.0000	20.9999	20.9926	20.8454	20.5846	20.3843	(87)
Th 2	20.2110	20.2133	20.2156	20.2271	20.2294	20.2409	20.2409	20.2432	20.2363	20.2294	20.2248	20.2202	(88)
util rest of house													
	0.9991	0.9971	0.9846	0.9040	0.6966	0.4656	0.3153	0.3582	0.6382	0.9529	0.9969	0.9994	(89)
MIT 2	19.4084	19.5623	19.8173	20.1089	20.2173	20.2406	20.2409	20.2432	20.2319	20.0615	19.6878	19.3913	(90)
Living area fraction										fLA = Living area / (4) =		0.3405	(91)
MIT	19.7465	19.8835	20.1113	20.3743	20.4786	20.4989	20.4994	20.5009	20.4910	20.3284	19.9932	19.7295	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7465	19.8835	20.1113	20.3743	20.4786	20.4989	20.4994	20.5009	20.4910	20.3284	19.9932	19.7295	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9989	0.9966	0.9839	0.9094	0.7146	0.4868	0.3377	0.3822	0.6630	0.9554	0.9964	0.9993	(94)
Useful gains	466.8713	526.9741	591.7614	621.4787	527.7985	355.1496	234.9753	246.2859	383.6778	480.0272	453.2838	444.5418	(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													
	970.5422	938.4895	849.8532	705.0808	537.6959	355.4848	234.9869	246.3184	387.6619	595.8773	794.8176	963.4774	(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													
	374.7312	276.5384	192.0203	60.1936	7.3637	0.0000	0.0000	0.0000	0.0000	86.1925	245.9044	386.0881	(98)
Space heating												1629.0321	(98)
Space heating per m2											(98) / (4) =	22.0139	(99)

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Boilers	1.0000	(303a)
Fraction of total space heat from community Boilers	1.0000	(304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.1000	(306)
Space heating:		
Annual space heating requirement	1629.0321	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.10	1791.9353	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	2030.5320	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.10	2233.5852	(310a)
Electricity used for heat distribution	40.2552	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.2500, SFP = 0.6625)		
mechanical ventilation fans (SFP = 0.6625)	151.9187	(330a)
Total electricity for the above, kWh/year	151.9187	(331)
Electricity for lighting (calculated in Appendix L)	325.0367	(332)
Total delivered energy for all uses	4502.4758	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Boilers			93.9000	(367a)
Space heating from Boilers	4287.0292	0.2160	925.9983	(367)
Electrical energy for heat distribution	40.2552	0.5190	20.8925	(372)
Total CO2 associated with community systems			946.8908	(373)
(negative value allowed since DFEE <= TFEE)				
Space and water heating			946.8908	(376)
Pumps and fans	151.9187	0.5190	78.8458	(378)
Energy for lighting	325.0367	0.5190	168.6941	(379)
Total CO2, kg/year			1194.4306	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			16.1400	(384)

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

DER		16.1400	ZC1
Total Floor Area	TFA	74.0000	
Assumed number of occupants	N	2.3392	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.5319	ZC2
CO2 emissions from cooking, equation (L16)		2.3668	ZC3
Total CO2 emissions		35.0387	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		35.0387	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	74.0000 (1b)	x	2.5400 (2b)	=	187.9600	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	187.9600	(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							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) =	0.1596	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.4096	(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) =	0.3482	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4439	0.4352	0.4265	0.3830	0.3743	0.3308	0.3308	0.3221	0.3482	0.3743	0.3917	0.4091	(22b)
Effective ac	0.5985	0.5947	0.5910	0.5733	0.5700	0.5547	0.5547	0.5519	0.5606	0.5700	0.5767	0.5837	(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 Semi-glazed door			2.1000	1.2000	2.5200			(26a)
TER Opening Type (Uw = 1.40)			16.4100	1.3258	21.7557			(27)
Heat Loss Floor 1			74.0000	0.1300	9.6200			(28a)
External Wall 1	49.5300	18.5100	31.0200	0.1800	5.5836			(29a)
Total net area of external elements Aum(A, m2)			123.5300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.4793			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.5349	(36)
Total fabric heat loss					(33) + (36) =		45.0142	(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	37.1249	36.8875	36.6549	35.5623	35.3579	34.4063	34.4063	34.2301	34.7729	35.3579	35.7715	36.2038	(38)
Heat transfer coeff	82.1390	81.9017	81.6691	80.5765	80.3721	79.4205	79.4205	79.2443	79.7870	80.3721	80.7856	81.2180	(39)
Average = Sum(39)m / 12 =												80.5755	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1100	1.1068	1.1036	1.0889	1.0861	1.0732	1.0732	1.0709	1.0782	1.0861	1.0917	1.0975	(40)
HLP (average)												1.0889	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3392	(42)
Average daily hot water use (litres/day)												89.7559	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	98.7314	95.1412	91.5510	87.9607	84.3705	80.7803	80.7803	84.3705	87.9607	91.5510	95.1412	98.7314	(44)
Energy conte	146.4159	128.0563	132.1426	115.2051	110.5421	95.3894	88.3923	101.4314	102.6429	119.6204	130.5750	141.7960	(45)
Energy content (annual)										Total = Sum(45)m =		1412.2092	(45)
Distribution loss (46)m = 0.15 x (45)m	21.9624	19.2084	19.8214	17.2808	16.5813	14.3084	13.2588	15.2147	15.3964	17.9431	19.5862	21.2694	(46)
Water storage loss:													
Store volume												2.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.2388	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.1290	(55)
Total storage loss													

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

	3.9977	3.6109	3.9977	3.8688	3.9977	3.8688	3.9977	3.9977	3.8688	3.9977	3.8688	3.9977	(56)
If cylinder contains dedicated solar storage													
	3.9977	3.6109	3.9977	3.8688	3.9977	3.8688	3.9977	3.9977	3.8688	3.9977	3.8688	3.9977	(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													
	173.6760	152.6783	159.4027	141.5859	137.8022	121.7702	115.6524	128.6916	129.0236	146.8805	156.9558	169.0561	(62)
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													
	173.6760	152.6783	159.4027	141.5859	137.8022	121.7702	115.6524	128.6916	129.0236	146.8805	156.9558	169.0561	(64)
								Total per year (kWh/year) = Sum(64)m =				1733.1754	(64)
Heat gains from water heating, kWh/month													
	70.4914	62.2764	65.7455	59.4103	58.5633	52.8216	51.1986	55.5341	55.2334	61.5819	64.5208	68.9553	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	18.4071	16.3490	13.2959	10.0659	7.5244	6.3524	6.8640	8.9221	11.9752	15.2052	17.7467	18.9187	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	206.4473	208.5895	203.1911	191.6984	177.1909	163.5559	154.4469	152.3047	157.7031	169.1958	183.7033	197.3383	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	(71)
Water heating gains (Table 5)													
	94.7465	92.6732	88.3676	82.5143	78.7142	73.3633	68.8153	74.6426	76.7130	82.7713	89.6122	92.6818	(72)
Total internal gains													
	380.6888	378.6997	365.9426	345.3665	324.5174	304.3596	291.2141	296.9572	307.4792	328.2603	352.1502	370.0267	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	2.9800	11.2829	0.6300	0.7000	0.7700	10.2757	(75)
West	13.4300	19.6403	0.6300	0.7000	0.7700	80.6112	(80)

Solar gains	90.8868	178.6090	297.3819	440.6420	547.3670	563.8571	535.3462	454.7292	347.9580	212.6770	113.4421	74.6823	(83)
Total gains	471.5756	557.3086	663.3245	786.0085	871.8843	868.2167	826.5602	751.6864	655.4372	540.9373	465.5923	444.7090	(84)

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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	62.5633	62.7446	62.9233	63.7765	63.9387	64.7048	64.7048	64.8487	64.4076	63.9387	63.6114	63.2728	
alpha	5.1709	5.1830	5.1949	5.2518	5.2626	5.3137	5.3137	5.3232	5.2938	5.2626	5.2408	5.2182	
util living area													
	0.9974	0.9933	0.9777	0.9155	0.7694	0.5708	0.4202	0.4796	0.7598	0.9618	0.9942	0.9981	(86)
MIT	19.8476	20.0214	20.3144	20.6722	20.9016	20.9837	20.9973	20.9948	20.9325	20.5947	20.1533	19.8203	(87)
Th 2	19.9927	19.9953	19.9979	20.0099	20.0122	20.0227	20.0227	20.0247	20.0187	20.0122	20.0076	20.0028	(88)
util rest of house													
	0.9965	0.9911	0.9703	0.8893	0.7119	0.4899	0.3283	0.3807	0.6798	0.9444	0.9919	0.9974	(89)
MIT 2	18.4590	18.7138	19.1378	19.6412	19.9230	20.0128	20.0218	20.0227	19.9685	19.5503	18.9161	18.4265	(90)
Living area fraction									fLA = Living area / (4) =			0.3405	(91)
MIT	18.9319	19.1591	19.5385	19.9923	20.2563	20.3434	20.3540	20.3537	20.2967	19.9060	19.3375	18.9012	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9319	19.1591	19.5385	19.9923	20.2563	20.3434	20.3540	20.3537	20.2967	19.9060	19.3375	18.9012	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9952	0.9886	0.9659	0.8888	0.7270	0.5171	0.3597	0.4145	0.7042	0.9421	0.9897	0.9964	(94)
Useful gains	469.2973	550.9451	640.7266	698.5949	633.8343	448.9376	297.2982	311.5720	461.5349	509.6110	460.7879	443.0931	(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													
	1201.8494	1167.8433	1064.8433	893.7774	687.6842	456.1431	298.1449	313.3112	494.4197	747.9389	988.6105	1193.9990	(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													
	545.0187	414.5556	315.5428	140.5314	40.0644	0.0000	0.0000	0.0000	0.0000	177.3160	380.0323	558.6740	(98)
Space heating												2571.7350	(98)
Space heating per m2										(98) / (4) =		34.7532	(99)

8c. Space cooling requirement

Not applicable

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												2750.5188	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	545.0187	414.5556	315.5428	140.5314	40.0644	0.0000	0.0000	0.0000	0.0000	177.3160	380.0323	558.6740	(98)
Space heating efficiency (main heating system 1)													
	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000		(210)
Space heating fuel (main heating system)													
	582.9077	443.3749	337.4789	150.3010	42.8496	0.0000	0.0000	0.0000	0.0000	189.6428	406.4516	597.5123	(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													
	173.6760	152.6783	159.4027	141.5859	137.8022	121.7702	115.6524	128.6916	129.0236	146.8805	156.9558	169.0561	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.6596	87.3476	86.6027	84.7939	81.9834	79.8000	79.8000	79.8000	79.8000	85.3171	87.0869	87.7662	(217)
Fuel for water heating, kWh/month													
	198.1255	174.7940	184.0621	166.9764	168.0856	152.5942	144.9279	161.2677	161.6838	172.1583	180.2289	192.6210	(219)
Water heating fuel used												2057.5253	(219)
Annual totals kWh/year													
Space heating fuel - main system												2750.5188	(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)												325.0756	(232)
Total delivered energy for all uses												5208.1196	(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	2750.5188	0.2160	594.1121	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2057.5253	0.2160	444.4255	(264)
Space and water heating			1038.5375	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	325.0756	0.5190	168.7142	(268)
Total CO2, kg/m2/year			1246.1767	(272)
Emissions per m2 for space and water heating			14.0343	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.2799	(272b)
Emissions per m2 for pumps and fans			0.5260	(272c)
Target Carbon Dioxide Emission Rate (TER) = (14.0343 * 1.00) + 2.2799 + 0.5260, rounded to 2 d.p.			16.8400	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	A-0-02	**Issued on Date**	05/02/2020
Assessment Reference	ASHP - Be lean	**Prop Type Ref**	2bed 3F
Property			

SAP Rating	83 B	**DER**	17.02	**TER**	17.58
Environmental	88 B	**% DER<TER**	3.18		
CO_2 Emissions (t/year)	1.01	**DFEE**	47.48	**TFEE**	51.31
General Requirements Compliance	Fail	**% DFEE<TFEE**	7.46		

Assessor Details	Miss Claudia Cioli, Claudia Cioli, Tel: 07481524839, clacioli@gmail.com	**Assessor ID**	R479-0001
Client			

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

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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England
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DWELLING AS DESIGNED

Ground-floor flat, total floor area 74 m²

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

1a TER and DER
Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 17.58 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 17.02 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)51.3 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)47.5 kWh/m²/yrOK

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2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.11 (max. 0.25)	0.11 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction

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

---
4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage Measured cylinder loss: 0.74 kWh/day
Permitted by DBSCG 0.32 Fail
Primary pipework insulated: No primary pipework

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

Hot water controls: No cylinderstat

---
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: 94%
Minimum: 70% OK

---
9 Summertime temperature
Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing North East: 3.35 m², No overhang
Windows facing North West: 15.10 m², Overhang width less than twice window, ratio 1.00
Air change rate: 0.50 ach
Blinds/curtains: None

---
10 Key features
Party wall U-value 0.00 W/m²K
Floor U-value 0.11 W/m²K
Air permeability 3.0 m³/m²h

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	74.0000 (1b)	x	2.5400 (2b)	=	187.9600	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	187.9600	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							0 * 10 =	0.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.0000	
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	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) =	79.9000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2631	0.2599	0.2567	0.2408	0.2376	0.2216	0.2216	0.2184	0.2280	0.2376	0.2439	0.2503	(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	
W03 (Uw = 1.40)			8.4000	1.3258	11.1364			(27)
door			2.1000	1.4000	2.9400			(26a)
W01 (Uw = 1.40)			10.0500	1.3258	13.3239			(27)
Heat Loss Floor 1			74.0000	0.1100	8.1400	110.0000	8140.0000	(28a)
External Wall 1	49.5300	20.5500	28.9800	0.1500	4.3470	140.0000	4057.2000	(29a)
Total net area of external elements Aum(A, m2)			123.5300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.8872			(33)
Party Wall 1			42.5000	0.0000	0.0000	140.0000	5950.0000	(32)
Party Ceilings			74.0000			80.0000	5920.0000	(32b)
Internal Wall			132.0000			9.0000	1188.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	25255.2000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		341.2865 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)		7.7649 (36)
Total fabric heat loss	(33) + (36) =	47.6521 (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	16.3169	16.1192	15.9215	14.9330	14.7352	13.7467	13.7467	13.5490	14.1421	14.7352	15.1307	15.5261	(38)
Heat transfer coeff	63.9691	63.7713	63.5736	62.5851	62.3874	61.3988	61.3988	61.2011	61.7942	62.3874	62.7828	63.1782	(39)
Average = Sum(39)m / 12 =												62.5357	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8644	0.8618	0.8591	0.8457	0.8431	0.8297	0.8297	0.8270	0.8351	0.8431	0.8484	0.8538	(40)
HLP (average)												0.8451	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.3392 (42)
Average daily hot water use (litres/day)	94.4799 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	103.9278	100.1486	96.3694	92.5903	88.8111	85.0319	85.0319	88.8111	92.5903	96.3694	100.1486	103.9278	(44)
Energy conte	154.1220	134.7961	139.0975	121.2685	116.3601	100.4099	93.0445	106.7699	108.0451	125.9162	137.4473	149.2589	(45)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy content (annual)											Total = Sum(45)m =	1486.5360	(45)
Distribution loss (46)m = 0.15 x (45)m													
	23.1183	20.2194	20.8646	18.1903	17.4540	15.0615	13.9567	16.0155	16.2068	18.8874	20.6171	22.3888	(46)
Water storage loss:													
Store volume												2.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.7400	(48)
Temperature factor from Table 2b												1.0000	(49)
Enter (49) or (54) in (55)												0.7400	(55)
Total storage loss													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(56)
If cylinder contains dedicated solar storage													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	200.3244	176.5273	185.2999	165.9805	162.5625	145.1219	139.2469	152.9723	152.7571	172.1186	182.1593	195.4613	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
										Solar input (sum of months) = Sum(63)m =		0.0000	(63)
Output from w/h													
	200.3244	176.5273	185.2999	165.9805	162.5625	145.1219	139.2469	152.9723	152.7571	172.1186	182.1593	195.4613	(64)
										Total per year (kWh/year) = Sum(64)m =		2030.5320	(64)
Heat gains from water heating, kWh/month													
	88.2075	78.2047	83.2118	76.0914	75.6516	69.1559	67.8992	72.4629	71.6946	78.8290	81.4708	86.5905	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	18.4049	16.3471	13.2943	10.0647	7.5235	6.3516	6.8632	8.9210	11.9737	15.2034	17.7446	18.9165	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	206.4473	208.5895	203.1911	191.6984	177.1909	163.5559	154.4469	152.3047	157.7031	169.1958	183.7033	197.3383	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	(71)
Water heating gains (Table 5)													
	118.5584	116.3760	111.8439	105.6825	101.6823	96.0498	91.2624	97.3964	99.5758	105.9530	113.1539	116.3851	(72)
Total internal gains													
	401.4985	399.4005	386.4172	365.5335	344.4846	324.0453	310.6604	316.7100	327.3406	348.4402	372.6898	390.7277	(73)

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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	
Northwest	8.4000	11.2829	0.3700	0.8900	0.7700	21.6285	(81)
Northeast	3.5000	11.2829	0.3700	0.6500	0.7700	6.2996	(75)
Northwest	6.7000	11.2829	0.3700	0.6500	0.7700	12.5993	(81)

Solar gains	40.5274	82.4947	148.6293	244.0919	328.1075	349.7973	327.2282	260.8701	181.1071	100.8151	50.9940	33.0967	(83)
Total gains	442.0260	481.8952	535.0465	609.6254	672.5921	673.8426	637.8886	577.5801	508.4477	449.2553	423.6837	423.8245	(84)

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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	109.6676	110.0076	110.3497	112.0927	112.4480	114.2584	114.2584	114.6276	113.5273	112.4480	111.7398	111.0404	
alpha	8.3112	8.3338	8.3566	8.4728	8.4965	8.6172	8.6172	8.6418	8.5685	8.4965	8.4493	8.4027	
util living area													
	0.9996	0.9990	0.9955	0.9644	0.8179	0.5808	0.4234	0.4869	0.8018	0.9860	0.9989	0.9997	(86)
MIT	20.3571	20.4402	20.6003	20.8257	20.9690	20.9984	20.9999	20.9997	20.9807	20.7881	20.5376	20.3445	(87)
Th 2	20.1978	20.2001	20.2024	20.2139	20.2162	20.2277	20.2277	20.2300	20.2231	20.2162	20.2116	20.2070	(88)
util rest of house													
	0.9994	0.9986	0.9934	0.9484	0.7649	0.5120	0.3491	0.4057	0.7281	0.9770	0.9982	0.9996	(89)
MIT 2	19.3332	19.4565	19.6915	20.0180	20.1908	20.2268	20.2276	20.2299	20.2107	19.9734	19.6085	19.3223	(90)
Living area fraction										fLA = Living area / (4) =		0.3405	(91)
MIT	19.6819	19.7915	20.0010	20.2931	20.4558	20.4896	20.4906	20.4920	20.4729	20.2508	19.9249	19.6704	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6819	19.7915	20.0010	20.2931	20.4558	20.4896	20.4906	20.4920	20.4729	20.2508	19.9249	19.6704	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9993	0.9983	0.9927	0.9503	0.7819	0.5355	0.3744	0.4334	0.7531	0.9775	0.9979	0.9995	(94)
Useful gains	441.7110	481.0617	531.1170	579.3158	525.9146	360.8266	238.8479	250.3330	382.9203	439.1543	422.7975	423.6100	(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													
	983.9667	949.6509	858.3071	713.0376	546.2501	361.6134	238.8795	250.4367	393.8102	602.0897	805.1840	977.3933	(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													
	403.4383	314.8919	243.4295	96.2797	15.1296	0.0000	0.0000	0.0000	0.0000	121.2239	275.3183	412.0147	(98)
Space heating												1881.7258	(98)
Space heating per m2											(98) / (4) =	25.4287	(99)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Boilers	1.0000	(303a)
Fraction of total space heat from community Boilers	1.0000	(304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.1000	(306)
Space heating:		
Annual space heating requirement	1881.7258	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.10	2069.8984	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	2030.5320	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.10	2233.5852	(310a)
Electricity used for heat distribution	43.0348	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.2500, SFP = 0.6625)		
mechanical ventilation fans (SFP = 0.6625)	151.9187	(330a)
Total electricity for the above, kWh/year	151.9187	(331)
Electricity for lighting (calculated in Appendix L)	325.0367	(332)
Total delivered energy for all uses	4780.4390	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Boilers			93.9000	(367a)
Space heating from Boilers	4583.0496	0.2160	989.9387	(367)
Electrical energy for heat distribution	43.0348	0.5190	22.3351	(372)
Total CO2 associated with community systems			1012.2738	(373)
(negative value allowed since DFEE <= TFEE)				
Space and water heating			1012.2738	(376)
Pumps and fans	151.9187	0.5190	78.8458	(378)
Energy for lighting	325.0367	0.5190	168.6941	(379)
Total CO2, kg/year			1259.8136	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			17.0200	(384)

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

DER		17.0200	ZC1
Total Floor Area	TFA	74.0000	
Assumed number of occupants	N	2.3392	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.5319	ZC2
CO2 emissions from cooking, equation (L16)		2.3668	ZC3
Total CO2 emissions		35.9187	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		35.9187	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	74.0000 (1b)	x	2.5400 (2b)	=	187.9600	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	187.9600	(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							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) =	0.1596	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.4096	(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) =	0.3482	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4439	0.4352	0.4265	0.3830	0.3743	0.3308	0.3308	0.3221	0.3482	0.3743	0.3917	0.4091	(22b)
Effective ac	0.5985	0.5947	0.5910	0.5733	0.5700	0.5547	0.5547	0.5519	0.5606	0.5700	0.5767	0.5837	(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 Semi-glazed door			2.1000	1.2000	2.5200			(26a)
TER Opening Type (Uw = 1.40)			16.4100	1.3258	21.7557			(27)
Heat Loss Floor 1			74.0000	0.1300	9.6200			(28a)
External Wall 1	49.5300	18.5100	31.0200	0.1800	5.5836			(29a)
Total net area of external elements Aum(A, m2)			123.5300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.4793			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.5349	(36)
Total fabric heat loss					(33) + (36) =		45.0142	(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	37.1249	36.8875	36.6549	35.5623	35.3579	34.4063	34.4063	34.2301	34.7729	35.3579	35.7715	36.2038	(38)
Heat transfer coeff	82.1390	81.9017	81.6691	80.5765	80.3721	79.4205	79.4205	79.2443	79.7870	80.3721	80.7856	81.2180	(39)
Average = Sum(39)m / 12 =												80.5755	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1100	1.1068	1.1036	1.0889	1.0861	1.0732	1.0732	1.0709	1.0782	1.0861	1.0917	1.0975	(40)
HLP (average)												1.0889	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3392	(42)
Average daily hot water use (litres/day)												89.7559	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	98.7314	95.1412	91.5510	87.9607	84.3705	80.7803	80.7803	84.3705	87.9607	91.5510	95.1412	98.7314	(44)
Energy conte	146.4159	128.0563	132.1426	115.2051	110.5421	95.3894	88.3923	101.4314	102.6429	119.6204	130.5750	141.7960	(45)
Energy content (annual)										Total = Sum(45)m =		1412.2092	(45)
Distribution loss (46)m = 0.15 x (45)m	21.9624	19.2084	19.8214	17.2808	16.5813	14.3084	13.2588	15.2147	15.3964	17.9431	19.5862	21.2694	(46)
Water storage loss:													
Store volume												2.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.2388	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.1290	(55)
Total storage loss													

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

	3.9977	3.6109	3.9977	3.8688	3.9977	3.8688	3.9977	3.9977	3.8688	3.9977	3.8688	3.9977	(56)
If cylinder contains dedicated solar storage													
	3.9977	3.6109	3.9977	3.8688	3.9977	3.8688	3.9977	3.9977	3.8688	3.9977	3.8688	3.9977	(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													
	173.6760	152.6783	159.4027	141.5859	137.8022	121.7702	115.6524	128.6916	129.0236	146.8805	156.9558	169.0561	(62)
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													
	173.6760	152.6783	159.4027	141.5859	137.8022	121.7702	115.6524	128.6916	129.0236	146.8805	156.9558	169.0561	(64)
								Total per year (kWh/year) = Sum(64)m =				1733.1754	(64)
Heat gains from water heating, kWh/month													
	70.4914	62.2764	65.7455	59.4103	58.5633	52.8216	51.1986	55.5341	55.2334	61.5819	64.5208	68.9553	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	18.4071	16.3490	13.2959	10.0659	7.5244	6.3524	6.8640	8.9221	11.9752	15.2052	17.7467	18.9187	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	206.4473	208.5895	203.1911	191.6984	177.1909	163.5559	154.4469	152.3047	157.7031	169.1958	183.7033	197.3383	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	(71)
Water heating gains (Table 5)													
	94.7465	92.6732	88.3676	82.5143	78.7142	73.3633	68.8153	74.6426	76.7130	82.7713	89.6122	92.6818	(72)
Total internal gains													
	380.6888	378.6997	365.9426	345.3665	324.5174	304.3596	291.2141	296.9572	307.4792	328.2603	352.1502	370.0267	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	2.9800	11.2829	0.6300	0.7000	0.7700	10.2757	(75)
Northwest	13.4300	11.2829	0.6300	0.7000	0.7700	46.3095	(81)

Solar gains	56.5852	115.1808	207.5191	340.8060	458.1102	488.3939	456.8825	364.2320	252.8653	140.7600	71.1988	46.2103	(83)
Total gains	437.2740	493.8804	573.4617	686.1725	782.6275	792.7535	748.0966	661.1892	560.3445	469.0203	423.3490	416.2370	(84)

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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	62.5633	62.7446	62.9233	63.7765	63.9387	64.7048	64.7048	64.8487	64.4076	63.9387	63.6114	63.2728	
alpha	5.1709	5.1830	5.1949	5.2518	5.2626	5.3137	5.3137	5.3232	5.2938	5.2626	5.2408	5.2182	
util living area													
	0.9982	0.9961	0.9879	0.9473	0.8204	0.6181	0.4627	0.5407	0.8336	0.9784	0.9962	0.9986	(86)
MIT	19.8043	19.9426	20.2094	20.5830	20.8647	20.9764	20.9958	20.9909	20.8927	20.5160	20.1006	19.7842	(87)
Th 2	19.9927	19.9953	19.9979	20.0099	20.0122	20.0227	20.0227	20.0247	20.0187	20.0122	20.0076	20.0028	(88)
util rest of house													
	0.9975	0.9948	0.9836	0.9287	0.7672	0.5334	0.3623	0.4315	0.7615	0.9677	0.9947	0.9981	(89)
MIT 2	18.3959	18.5995	18.9888	19.5250	19.8850	20.0079	20.0212	20.0211	19.9329	19.4431	18.8397	18.3738	(90)
Living area fraction									fLA = Living area / (4) =			0.3405	(91)
MIT	18.8755	19.0568	19.4044	19.8853	20.2186	20.3378	20.3531	20.3513	20.2598	19.8084	19.2691	18.8541	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8755	19.0568	19.4044	19.8853	20.2186	20.3378	20.3531	20.3513	20.2598	19.8084	19.2691	18.8541	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9965	0.9931	0.9802	0.9259	0.7793	0.5615	0.3966	0.4689	0.7813	0.9648	0.9931	0.9973	(94)
Useful gains	435.7521	490.4623	562.1247	635.3230	609.9123	445.1543	296.7198	310.0100	437.7826	452.4935	420.4194	415.1094	(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													
	1197.2172	1159.4695	1053.8945	885.1574	684.6607	455.6950	298.0731	313.1211	491.4692	740.0999	983.0863	1190.1742	(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													
	566.5300	449.5729	365.8767	179.8808	55.6127	0.0000	0.0000	0.0000	0.0000	213.9792	405.1201	576.6482	(98)
Space heating												2813.2207	(98)
Space heating per m2											(98) / (4) =	38.0165	(99)

8c. Space cooling requirement

Not applicable

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												3008.7922	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	566.5300	449.5729	365.8767	179.8808	55.6127	0.0000	0.0000	0.0000	0.0000	213.9792	405.1201	576.6482	(98)
Space heating efficiency (main heating system 1)													
	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)													
	605.9145	480.8266	391.3120	192.3859	59.4789	0.0000	0.0000	0.0000	0.0000	228.8547	433.2835	616.7360	(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													
	173.6760	152.6783	159.4027	141.5859	137.8022	121.7702	115.6524	128.6916	129.0236	146.8805	156.9558	169.0561	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.7397	87.5248	86.9615	85.4535	82.6083	79.8000	79.8000	79.8000	79.8000	85.8164	87.2338	87.8301	(217)
Fuel for water heating, kWh/month													
	197.9447	174.4400	183.3026	165.6878	166.8140	152.5942	144.9279	161.2677	161.6838	171.1566	179.9255	192.4807	(219)
Water heating fuel used												2052.2254	(219)
Annual totals kWh/year													
Space heating fuel - main system												3008.7922	(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)												325.0756	(232)
Total delivered energy for all uses												5461.0931	(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	3008.7922	0.2160	649.8991	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2052.2254	0.2160	443.2807	(264)
Space and water heating			1093.1798	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	325.0756	0.5190	168.7142	(268)
Total CO2, kg/m2/year			1300.8190	(272)
Emissions per m2 for space and water heating			14.7727	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.2799	(272b)
Emissions per m2 for pumps and fans			0.5260	(272c)
Target Carbon Dioxide Emission Rate (TER) = (14.7727 * 1.00) + 2.2799 + 0.5260, rounded to 2 d.p.			17.5800	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	A-0-06	**Issued on Date**	05/02/2020
Assessment Reference	ASHP - Be lean	**Prop Type Ref**	2bed 3F
Property			

SAP Rating	85 B	**DER**	14.65	**TER**	15.30
Environmental	88 B	**% DER<TER**	4.27		
CO_2 Emissions (t/year)	1.19	**DFEE**	43.30	**TFEE**	47.30
General Requirements Compliance	Fail	**% DFEE<TFEE**	8.45		

Assessor Details	Miss Claudia Cioli, Claudia Cioli, Tel: 07481524839, clacioli@gmail.com	**Assessor ID**	R479-0001
Client			

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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England
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DWELLING AS DESIGNED

Ground-floor flat, total floor area 102 m²

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

1a TER and DER
Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 15.30 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 14.65 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)47.3 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)43.3 kWh/m²/yrOK

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2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.11 (max. 0.25)	0.11 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction

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

---
4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage Measured cylinder loss: 0.74 kWh/day
Permitted by DBSCG 0.32 Fail
Primary pipework insulated: No primary pipework

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

Hot water controls: No cylinderstat

---
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: 94%
Minimum: 70% OK

---
9 Summertime temperature
Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing East: 7.61 m², No overhang
Windows facing South West: 15.08 m², No overhang
Air change rate: 0.50 ach
Blinds/curtains: None

---
10 Key features
Party wall U-value 0.00 W/m²K
Floor U-value 0.11 W/m²K
Air permeability 3.0 m³/m²h

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	102.0000 (1b)	x	2.5400 (2b)	=	259.0800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	102.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	259.0800	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							0 * 10 =	0.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.0000	
Infiltration rate		0.1500	(18)
Number of sides sheltered		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

If mechanical ventilation:	0.5000	(23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	79.9000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2774	0.2739	0.2705	0.2531	0.2497	0.2323	0.2323	0.2288	0.2393	0.2497	0.2566	0.2635	(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	
W08 (Uw = 1.40)			11.2800	1.3258	14.9545			(27)
door			2.1000	1.4000	2.9400			(26a)
W11 (Uw = 1.40)			11.4100	1.3258	15.1269			(27)
Heat Loss Floor 1			102.0000	0.1100	11.2200	110.0000	11220.0000	(28a)
External Wall 1	71.1000	22.6900	48.4100	0.1500	7.2615	140.0000	6777.4000	(29a)
Corridor wall	3.8000	2.1000	1.7000	0.1409	0.2395	110.0000	187.0000	(29a)
Total net area of external elements Aum(A, m2)			176.9000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	51.7425			(33)
Party Wall 1			45.7000	0.0000	0.0000	140.0000	6398.0000	(32)
Party Ceilings			102.0000			80.0000	8160.0000	(32b)
Internal Wall			166.0000			9.0000	1494.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 34236.4000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	335.6510	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	11.3039	(36)
Total fabric heat loss	(33) + (36) = 63.0464	(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	23.7172	23.4207	23.1241	21.6413	21.3447	19.8619	19.8619	19.5653	20.4550	21.3447	21.9378	22.5310	(38)
Heat transfer coeff	86.7636	86.4671	86.1705	84.6877	84.3911	82.9083	82.9083	82.6117	83.5014	84.3911	84.9842	85.5774	(39)
Average = Sum(39)m / 12 =												84.6135	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8506	0.8477	0.8448	0.8303	0.8274	0.8128	0.8128	0.8099	0.8186	0.8274	0.8332	0.8390	(40)
HLP (average)												0.8295	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.7573 (42)
Average daily hot water use (litres/day)	104.9321 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	115.4253	111.2280	107.0308	102.8335	98.6362	94.4389	94.4389	98.6362	102.8335	107.0308	111.2280	115.4253	(44)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy conte	171.1724	149.7085	154.4858	134.6844	129.2329	111.5182	103.3380	118.5819	119.9981	139.8462	152.6531	165.7714	(45)
Energy content (annual)										Total = Sum(45)m =		1650.9909	(45)
Distribution loss (46)m = 0.15 x (45)m													
	25.6759	22.4563	23.1729	20.2027	19.3849	16.7277	15.5007	17.7873	17.9997	20.9769	22.8980	24.8657	(46)
Water storage loss:													
Store volume												2.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.7400	(48)
Temperature factor from Table 2b												1.0000	(49)
Enter (49) or (54) in (55)												0.7400	(55)
Total storage loss													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(56)
If cylinder contains dedicated solar storage													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(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													
	217.3748	191.4397	200.6882	179.3964	175.4353	156.2302	149.5404	164.7843	164.7101	186.0486	197.3651	211.9738	(62)
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													
	217.3748	191.4397	200.6882	179.3964	175.4353	156.2302	149.5404	164.7843	164.7101	186.0486	197.3651	211.9738	(64)
									Total per year (kWh/year) = Sum(64)m =			2194.9869	(64)
Heat gains from water heating, kWh/month													
	93.8768	83.1630	88.3284	80.5522	79.9319	72.8494	71.3218	76.3904	75.6690	83.4608	86.5267	92.0809	(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	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	23.1365	20.5496	16.7121	12.6521	9.4576	7.9845	8.6275	11.2144	15.0520	19.1119	22.3064	23.7795	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	259.5211	262.2141	255.4278	240.9805	222.7434	205.6032	194.1524	191.4594	198.2457	212.6930	230.9300	248.0703	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.7864	36.7864	36.7864	36.7864	36.7864	36.7864	36.7864	36.7864	36.7864	36.7864	36.7864	36.7864	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	(71)
Water heating gains (Table 5)													
	126.1784	123.7545	118.7210	111.8780	107.4353	101.1797	95.8626	102.6753	105.0958	112.1785	120.1760	123.7646	(72)
Total internal gains													
	473.1953	470.8775	455.2201	429.8699	403.9956	379.1267	363.0019	369.7083	382.7527	408.3426	437.7718	459.9738	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	11.2800	36.7938	0.3700	0.8900	0.7700	94.7129	(79)
East	7.6100	19.6403	0.3700	0.6800	0.7700	26.0601	(76)
Southwest	3.8000	36.7938	0.3700	0.6800	0.7700	24.3782	(79)

Solar gains	145.1512	253.8353	361.5120	466.3500	535.2631	536.0306	514.9372	463.5048	398.1787	284.6903	175.1376	123.3477	(83)
Total gains	618.3465	724.7128	816.7322	896.2200	939.2587	915.1573	877.9391	833.2131	780.9315	693.0330	612.9094	583.3215	(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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	109.6094	109.9854	110.3639	112.2963	112.6909	114.7064	114.7064	115.1182	113.8916	112.6909	111.9044	111.1288	
alpha	8.3073	8.3324	8.3576	8.4864	8.5127	8.6471	8.6471	8.6745	8.5928	8.5127	8.4603	8.4086	
util living area													
	0.9995	0.9979	0.9899	0.9441	0.7992	0.5776	0.4154	0.4558	0.7228	0.9685	0.9981	0.9997	(86)
MIT	20.3710	20.4934	20.6659	20.8644	20.9741	20.9985	20.9999	20.9998	20.9911	20.8432	20.5677	20.3520	(87)
Th 2	20.2097	20.2122	20.2147	20.2272	20.2297	20.2422	20.2422	20.2447	20.2372	20.2297	20.2247	20.2197	(88)
util rest of house													
	0.9993	0.9970	0.9855	0.9223	0.7462	0.5104	0.3439	0.3811	0.6501	0.9514	0.9971	0.9996	(89)
MIT 2	19.3643	19.5450	19.7964	20.0797	20.2086	20.2415	20.2422	20.2447	20.2319	20.0591	19.6642	19.3446	(90)
Living area fraction										fLA = Living area / (4) =		0.3696	(91)
MIT	19.7364	19.8956	20.1177	20.3697	20.4915	20.5213	20.5223	20.5238	20.5125	20.3489	19.9981	19.7169	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7364	19.8956	20.1177	20.3697	20.4915	20.5213	20.5223	20.5238	20.5125	20.3489	19.9981	19.7169	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9991	0.9965	0.9848	0.9269	0.7650	0.5353	0.3704	0.4088	0.6770	0.9545	0.9968	0.9994	(94)
Useful gains	617.8042	722.1926	804.3025	830.6661	718.5060	489.8757	325.1500	340.5879	528.6959	661.5021	610.9256	582.9973	(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													
	1339.3169	1296.6215	1173.4481	971.3416	741.9246	490.9211	325.1882	340.6739	535.4507	822.7185	1096.1374	1327.8995	(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													
	536.8054	386.0162	274.6443	101.2863	17.4234	0.0000	0.0000	0.0000	0.0000	119.9450	349.3525	554.2073	(98)
Space heating												2339.6805	(98)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Space heating per m2		(98) / (4) =	22.9380 (99)

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1000 (306)
Space heating:	
Annual space heating requirement	2339.6805 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.10	2573.6485 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2194.9869 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.10	2414.4855 (310a)
Electricity used for heat distribution	49.8813 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.2500, SFP = 0.6625)	
mechanical ventilation fans (SFP = 0.6625)	209.4014 (330a)
Total electricity for the above, kWh/year	209.4014 (331)
Electricity for lighting (calculated in Appendix L)	408.5977 (332)
Total delivered energy for all uses	5606.1332 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Boilers			93.9000	(367a)
Space heating from Boilers	5312.1769	0.2160	1147.4302	(367)
Electrical energy for heat distribution	49.8813	0.5190	25.8884	(372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			1173.3186	(373)
Space and water heating			1173.3186	(376)
Pumps and fans	209.4014	0.5190	108.6793	(378)
Energy for lighting	408.5977	0.5190	212.0622	(379)
Total CO2, kg/year			1494.0602	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			14.6500	(384)

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

DER		14.6500	ZC1
Total Floor Area	TFA	102.0000	
Assumed number of occupants	N	2.7573	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		15.0771	ZC2
CO2 emissions from cooking, equation (L16)		1.8154	ZC3
Total CO2 emissions		31.5426	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		31.5426	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	102.0000 (1b)	x	2.5400 (2b)	=	259.0800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	102.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	259.0800	(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							4 * 10 =	40.0000	(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) =	40.0000 / (5) =	0.1544	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.4044	(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) =	0.3741	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4769	0.4676	0.4582	0.4115	0.4021	0.3554	0.3554	0.3460	0.3741	0.4021	0.4208	0.4395	(22b)
Effective ac	0.6137	0.6093	0.6050	0.5847	0.5808	0.5631	0.5631	0.5599	0.5700	0.5808	0.5885	0.5966	(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 Semi-glazed door			2.1000	1.2000	2.5200			(26a)
TER Opening Type (Uw = 1.40)			22.6900	1.3258	30.0814			(27)
Heat Loss Floor 1			102.0000	0.1300	13.2600			(28a)
External Wall 1	71.1000	22.6900	48.4100	0.1800	8.7138			(29a)
Corridor wall	3.8000	2.1000	1.7000	0.1800	0.3060			(29a)
Total net area of external elements Aum(A, m2)			176.9000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	54.8812			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	8.9914	(36)
Total fabric heat loss (33) + (36) =	63.8726	(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	52.4718	52.0942	51.7241	49.9858	49.6605	48.1465	48.1465	47.8661	48.7297	49.6605	50.3185	51.0064	(38)
Heat transfer coeff	116.3445	115.9669	115.5968	113.8584	113.5332	112.0191	112.0191	111.7387	112.6023	113.5332	114.1911	114.8790	(39)
Average = Sum(39)m / 12 =												113.8569	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1406	1.1369	1.1333	1.1163	1.1131	1.0982	1.0982	1.0955	1.1039	1.1131	1.1195	1.1263	(40)
HLP (average)												1.1162	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.7573 (42)
Average daily hot water use (litres/day)	99.6855 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.6541	105.6666	101.6792	97.6918	93.7044	89.7170	89.7170	93.7044	97.6918	101.6792	105.6666	109.6541	(44)
Energy conte	162.6138	142.2231	146.7615	127.9502	122.7713	105.9423	98.1711	112.6528	113.9982	132.8539	145.0204	157.4828	(45)
Energy content (annual)										Total = Sum(45)m =		1568.4413	(45)
Distribution loss (46)m = 0.15 x (45)m	24.3921	21.3335	22.0142	19.1925	18.4157	15.8913	14.7257	16.8979	17.0997	19.9281	21.7531	23.6224	(46)

Water storage loss:	
Store volume	2.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	0.2388 (48)
Temperature factor from Table 2b	0.5400 (49)
Enter (49) or (54) in (55)	0.1290 (55)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss
3.9977 3.6109 3.9977 3.8688 3.9977 3.8688 3.9977 3.9977 3.8688 3.9977 3.8688 3.9977 (56)
If cylinder contains dedicated solar storage
3.9977 3.6109 3.9977 3.8688 3.9977 3.8688 3.9977 3.9977 3.8688 3.9977 3.8688 3.9977 (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
189.8740 166.8451 174.0216 154.3310 150.0314 132.3231 125.4312 139.9129 140.3790 160.1140 171.4012 184.7429 (62)
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
189.8740 166.8451 174.0216 154.3310 150.0314 132.3231 125.4312 139.9129 140.3790 160.1140 171.4012 184.7429 (64)
Total per year (kWh/year) = Sum(64)m = 1889.4075 (64)
Heat gains from water heating, kWh/month
75.8772 66.9868 70.6063 63.6481 62.6296 56.3304 54.4500 59.2652 59.0090 65.9820 69.3239 74.1711 (65)

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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	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
23.1376 20.5506 16.7129 12.6527 9.4581 7.9849 8.6280 11.2149 15.0527 19.1128 22.3075 23.7806 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
259.5211 262.2141 255.4278 240.9805 222.7434 205.6032 194.1524 191.4594 198.2457 212.6930 230.9300 248.0703 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
36.7864 36.7864 36.7864 36.7864 36.7864 36.7864 36.7864 36.7864 36.7864 36.7864 36.7864 36.7864 (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)
-110.2914 -110.2914 -110.2914 -110.2914 -110.2914 -110.2914 -110.2914 -110.2914 -110.2914 -110.2914 -110.2914 -110.2914 (71)
Water heating gains (Table 5)
101.9855 99.6828 94.9009 88.4001 84.1795 78.2367 73.1855 79.6575 81.9570 88.6855 96.2832 99.6924 (72)
Total internal gains
452.0034 449.8067 434.4009 409.3926 383.7403 359.1840 343.3251 349.6911 362.6146 387.8506 416.8800 438.9026 (73)

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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	7.6100	19.6403	0.6300	0.7000	0.7700	45.6777	(76)
Southwest	15.0800	36.7938	0.6300	0.7000	0.7700	169.5697	(79)

Solar gains	215.2473	378.1951	542.3586	704.2933	811.4994	813.7609	781.3036	701.2876	599.0693	425.2571	260.0601	182.6794	(83)
Total gains	667.2508	828.0018	976.7595	1113.6859	1195.2397	1172.9450	1124.6288	1050.9786	961.6839	813.1077	676.9401	621.5820	(84)

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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	60.8824	61.0807	61.2762	62.2118	62.3900	63.2333	63.2333	63.3919	62.9058	62.3900	62.0305	61.6591	
alpha	5.0588	5.0720	5.0851	5.1475	5.1593	5.2156	5.2156	5.2261	5.1937	5.1593	5.1354	5.1106	

util living area
0.9971 0.9909 0.9722 0.9121 0.7816 0.5921 0.4349 0.4830 0.7380 0.9495 0.9928 0.9979 (86)

MIT	19.8216	20.0341	20.3290	20.6648	20.8873	20.9791	20.9965	20.9941	20.9376	20.6211	20.1526	19.7889	(87)
Th 2	19.9678	19.9708	19.9737	19.9876	19.9902	20.0023	20.0023	20.0045	19.9976	19.9902	19.9849	19.9794	(88)

util rest of house
0.9961 0.9880 0.9631 0.8850 0.7241 0.5079 0.3381 0.3817 0.6558 0.9277 0.9899 0.9972 (89)

MIT 2	18.4032	18.7141	19.1394	19.6119	19.8874	19.9894	20.0011	20.0023	19.9522	19.5669	18.8984	18.3638	(90)

Living area fraction fLA = Living area / (4) = 0.3696 (91)

MIT	18.9274	19.2020	19.5791	20.0011	20.2570	20.3552	20.3690	20.3689	20.3164	19.9565	19.3619	18.8905	(92)

Temperature adjustment 0.0000
adjusted MIT 18.9274 19.2020 19.5791 20.0011 20.2570 20.3552 20.3690 20.3689 20.3164 19.9565 19.3619 18.8905 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9947	0.9850	0.9587	0.8854	0.7404	0.5385	0.3740	0.4193	0.6836	0.9268	0.9875	0.9962	(94)
Useful gains	663.6814	815.5886	936.4452	986.0461	884.9269	631.5766	420.6028	440.6414	657.4375	753.6179	668.4721	619.1937	(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
1701.8192 1658.5530 1511.8966 1263.9509 971.5007 644.6966 422.1983 443.4760 699.9799 1062.2786 1400.2047 1687.6324 (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
772.3745 566.4721 428.1358 200.0915 64.4109 0.0000 0.0000 0.0000 0.0000 229.6436 526.8474 794.9184 (98)
Space heating 3582.8941 (98)
Space heating per m2 (98) / (4) = 35.1264 (99)

8c. Space cooling requirement

Not applicable

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												3831.9723	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	772.3745	566.4721	428.1358	200.0915	64.4109	0.0000	0.0000	0.0000	0.0000	229.6436	526.8474	794.9184	(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)	826.0690	605.8525	457.8993	214.0016	68.8887	0.0000	0.0000	0.0000	0.0000	245.6081	563.4732	850.1801	(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	189.8740	166.8451	174.0216	154.3310	150.0314	132.3231	125.4312	139.9129	140.3790	160.1140	171.4012	184.7429	(64)
Efficiency of water heater												79.8000	(216)
(217)m	88.1673	87.8208	87.1239	85.5075	82.7383	79.8000	79.8000	79.8000	79.8000	85.7753	87.6162	88.2681	(217)
Fuel for water heating, kWh/month	215.3565	189.9836	199.7403	180.4882	181.3326	165.8184	157.1820	175.3295	175.9135	186.6669	195.6274	209.2975	(219)
Water heating fuel used												2232.7364	(219)
Annual totals kWh/year													
Space heating fuel - main system												3831.9723	(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)												408.6169	(232)
Total delivered energy for all uses												6548.3256	(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	3831.9723	0.2160	827.7060	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2232.7364	0.2160	482.2711	(264)
Space and water heating			1309.9771	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	408.6169	0.5190	212.0722	(268)
Total CO2, kg/m2/year			1560.9743	(272)
Emissions per m2 for space and water heating			12.8429	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.0791	(272b)
Emissions per m2 for pumps and fans			0.3816	(272c)
Target Carbon Dioxide Emission Rate (TER) = (12.8429 * 1.00) + 2.0791 + 0.3816, rounded to 2 d.p.			15.3000	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	A-1-01	**Issued on Date**	05/02/2020
Assessment Reference	ASHP - Be Lean	**Prop Type Ref**	2bed 3F
Property			

SAP Rating	83 B	**DER**	17.26	**TER**	17.69
Environmental	89 B	**% DER<TER**	2.44		
CO_2 Emissions (t/year)	0.79	**DFEE**	42.59	**TFEE**	44.47
General Requirements Compliance	Fail	**% DFEE<TFEE**	4.23		

Assessor Details	Miss Claudia Cioli, Claudia Cioli, Tel: 07481524839, clacioli@gmail.com	**Assessor ID**	R479-0001
Client			

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

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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England
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DWELLING AS DESIGNED

Mid-floor flat, total floor area 55 m²

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

1a TER and DER
Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 17.69 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 17.26 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)44.5 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)42.6 kWh/m²/yrOK

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2 Fabric U-values

Element	Average	Highest	
External wall	0.14 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.38 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction

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

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4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None

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5 Cylinder insulation
Hot water storage Measured cylinder loss: 0.74 kWh/day
Permitted by DBSCG 0.32 Fail
Primary pipework insulated: No primary pipework

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

Hot water controls: No cylinderstat

---
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: 94%
Minimum: 70% OK

---
9 Summertime temperature
Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing North: 8.40 m², No overhang
Windows facing North East: 1.64 m², No overhang
Windows facing South East: 7.61 m², No overhang
Air change rate: 0.50 ach
Blinds/curtains: None

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10 Key features
Party wall U-value 0.00 W/m²K
Air permeability 3.0 m³/m²h

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	54.5000 (1b)	x	2.5400 (2b)	=	138.4300	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	54.5000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	138.4300	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							0 * 10 =	0.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.0000	
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1163	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation:	0.5000	(23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	79.9000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2487	0.2458	0.2429	0.2284	0.2255	0.2109	0.2109	0.2080	0.2168	0.2255	0.2313	0.2371	(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	
W05 (Uw = 1.40)			1.6400	1.3258	2.1742			(27)
W03 (Uw = 1.40)			8.4000	1.3258	11.1364			(27)
W02 (Uw = 1.40)			7.6100	1.3258	10.0890			(27)
door			2.1000	1.2500	2.6250			(26a)
External Wall 1	32.4000	17.6500	14.7500	0.1500	2.2125	140.0000	2065.0000	(29a)
Corridor wall	43.3000	2.1000	41.2000	0.1409	5.8055	110.0000	4532.0000	(29a)
Total net area of external elements Aum(A, m2)			75.7000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		34.0427			(33)
Party Wall 1			19.4000	0.0000	0.0000	140.0000	2716.0000	(32)
Party Floor 1			54.5000			40.0000	2180.0000	(32d)
Party Ceilings			54.5000			80.0000	4360.0000	(32b)
Internal Wall			73.4000			9.0000	660.6000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 16513.6000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	303.0018	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	5.2116	(36)
Total fabric heat loss	(33) + (36) = 39.2543	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	11.3619	11.2292	11.0964	10.4326	10.2998	9.6360	9.6360	9.5033	9.9016	10.2998	10.5654	10.8309	(38)
Heat transfer coeff	50.6162	50.4834	50.3507	49.6869	49.5541	48.8903	48.8903	48.7575	49.1558	49.5541	49.8196	50.0852	(39)
Average = Sum(39)m / 12 =												49.6537	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9287	0.9263	0.9239	0.9117	0.9092	0.8971	0.8971	0.8946	0.9019	0.9092	0.9141	0.9190	(40)
HLP (average)												0.9111	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.8227 (42)
Average daily hot water use (litres/day)	81.5674 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	89.7241	86.4614	83.1987	79.9360	76.6733	73.4106	73.4106	76.6733	79.9360	83.1987	86.4614	89.7241	(44)
Energy conte	133.0582	116.3736	120.0871	104.6949	100.4572	86.6869	80.3282	92.1778	93.2787	108.7073	118.6625	128.8598	(45)
Energy content (annual)										Total = Sum(45)m =		1283.3722	(45)
Distribution loss (46)m = 0.15 x (45)m													
	19.9587	17.4560	18.0131	15.7042	15.0686	13.0030	12.0492	13.8267	13.9918	16.3061	17.7994	19.3290	(46)
Water storage loss:													
Store volume												2.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.7400	(48)
Temperature factor from Table 2b												1.0000	(49)
Enter (49) or (54) in (55)												0.7400	(55)
Total storage loss													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(56)
If cylinder contains dedicated solar storage													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(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													
	179.2606	158.1048	166.2895	149.4069	146.6596	131.3989	126.5306	138.3802	137.9907	154.9097	163.3745	175.0622	(62)
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													
	179.2606	158.1048	166.2895	149.4069	146.6596	131.3989	126.5306	138.3802	137.9907	154.9097	163.3745	175.0622	(64)
									Total per year (kWh/year) = Sum(64)m =			1827.3682	(64)
Heat gains from water heating, kWh/month													
	81.2038	72.0792	76.8909	70.5806	70.3639	64.5930	63.6710	67.6110	66.7848	73.1071	75.2249	79.8078	(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	91.1347	91.1347	91.1347	91.1347	91.1347	91.1347	91.1347	91.1347	91.1347	91.1347	91.1347	91.1347	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	14.1657	12.5819	10.2323	7.7465	5.7906	4.8887	5.2824	6.8662	9.2158	11.7016	13.6575	14.5594	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	158.8961	160.5450	156.3899	147.5444	136.3784	125.8840	118.8731	117.2242	121.3793	130.2248	141.3908	151.8852	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	32.1135	32.1135	32.1135	32.1135	32.1135	32.1135	32.1135	32.1135	32.1135	32.1135	32.1135	32.1135	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-72.9078	-72.9078	-72.9078	-72.9078	-72.9078	-72.9078	-72.9078	-72.9078	-72.9078	-72.9078	-72.9078	-72.9078	(71)
Water heating gains (Table 5)													
	109.1449	107.2607	103.3480	98.0287	94.5752	89.7125	85.5794	90.8750	92.7566	98.2622	104.4790	107.2686	(72)
Total internal gains													
	332.5471	330.7279	320.3106	303.6599	287.0846	270.8256	260.0752	265.3059	273.6921	290.5291	309.8677	324.0536	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	1.6400	11.2829	0.3700	0.7900	0.7700	3.7482	(75)
North	8.4000	10.6334	0.3700	0.8900	0.7700	20.3834	(74)
Southeast	7.6100	36.7938	0.5600	0.6800	0.7700	73.8907	(77)

Solar gains	98.0223	172.4466	252.1496	342.2747	412.5714	422.9506	402.1702	347.3383	282.8027	194.7990	118.3658	83.2886	(83)
Total gains	430.5694	503.1745	572.4601	645.9346	699.6560	693.7762	662.2454	612.6442	556.4948	485.3280	428.2335	407.3422	(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	90.6253	90.8637	91.1033	92.3204	92.5677	93.8246	93.8246	94.0801	93.3178	92.5677	92.0744	91.5862	
alpha	7.0417	7.0576	7.0736	7.1547	7.1712	7.2550	7.2550	7.2720	7.2212	7.1712	7.1383	7.1057	
util living area													
	0.9957	0.9868	0.9550	0.8437	0.6470	0.4502	0.3248	0.3659	0.6027	0.9023	0.9874	0.9970	(86)
MIT	20.3632	20.5164	20.7195	20.9138	20.9875	20.9992	20.9999	20.9999	20.9942	20.8812	20.5868	20.3335	(87)
Th 2	20.1431	20.1452	20.1473	20.1576	20.1596	20.1700	20.1700	20.1721	20.1658	20.1596	20.1555	20.1514	(88)
util rest of house													
	0.9942	0.9822	0.9405	0.8059	0.5930	0.3922	0.2635	0.3002	0.5330	0.8667	0.9821	0.9959	(89)
MIT 2	19.3061	19.5283	19.8140	20.0706	20.1499	20.1696	20.1700	20.1720	20.1624	20.0405	19.6397	19.2695	(90)
Living area fraction									fLA = Living area / (4) =			0.4624	(91)
MIT	19.7949	19.9852	20.2327	20.4605	20.5372	20.5532	20.5537	20.5548	20.5470	20.4292	20.0776	19.7615	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7949	19.9852	20.2327	20.4605	20.5372	20.5532	20.5537	20.5548	20.5470	20.4292	20.0776	19.7615	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9933	0.9811	0.9422	0.8202	0.6176	0.4191	0.2919	0.3306	0.5652	0.8792	0.9815	0.9952	(94)
Useful gains	427.6998	493.6744	539.3488	529.8102	432.1033	290.7424	193.2812	202.5342	314.5454	426.6966	420.3181	405.3984	(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													
	784.2930	761.5517	691.4495	574.4027	437.9197	291.0522	193.2993	202.5776	316.9081	487.0779	646.5406	779.4005	(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													
	265.3054	180.0135	113.1630	32.1066	4.3274	0.0000	0.0000	0.0000	0.0000	44.9237	162.8802	278.2576	(98)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Space heating		1080.9773 (98)
Space heating per m2	(98) / (4) =	19.8344 (99)

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1000 (306)
Space heating:	
Annual space heating requirement	1080.9773 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.10	1189.0750 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1827.3682 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.10	2010.1050 (310a)
Electricity used for heat distribution	31.9918 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.2500, SFP = 0.6625)	
mechanical ventilation fans (SFP = 0.6625)	111.8860 (330a)
Total electricity for the above, kWh/year	111.8860 (331)
Electricity for lighting (calculated in Appendix L)	250.1708 (332)
Total delivered energy for all uses	3561.2368 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Boilers			93.9000	(367a)
Space heating from Boilers	3407.0075	0.2160	735.9136	(367)
Electrical energy for heat distribution	31.9918	0.5190	16.6037	(372)
Total CO2 associated with community systems			752.5174	(373)
(negative value allowed since DFEE <= TFEE)				
Space and water heating			752.5174	(376)
Pumps and fans	111.8860	0.5190	58.0689	(378)
Energy for lighting	250.1708	0.5190	129.8386	(379)
Total CO2, kg/year			940.4249	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			17.2600	(384)

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

DER		17.2600	ZC1
Total Floor Area	TFA	54.5000	
Assumed number of occupants	N	1.8227	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.2768	ZC2
CO2 emissions from cooking, equation (L16)		2.9861	ZC3
Total CO2 emissions		37.5229	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		37.5229	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	54.5000 (1b)	x	2.5400 (2b)	=	138.4300	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	54.5000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	138.4300	(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)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1445	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3945	(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) =	0.3057	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3898	0.3821	0.3745	0.3363	0.3286	0.2904	0.2904	0.2828	0.3057	0.3286	0.3439	0.3592	(22b)
Effective ac	0.5760	0.5730	0.5701	0.5565	0.5540	0.5422	0.5422	0.5400	0.5467	0.5540	0.5591	0.5645	(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 Semi-glazed door			2.1000	1.2000	2.5200			(26a)
TER Opening Type (Uw = 1.40)			11.5200	1.3258	15.2727			(27)
External Wall 1	32.4000	11.5200	20.8800	0.1800	3.7584			(29a)
Corridor wall	43.3000	2.1000	41.2000	0.1800	7.4160			(29a)
Total net area of external elements Aum(A, m2)			75.7000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.9671			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							3.1241	(36)
Total fabric heat loss					(33) + (36) =		32.0912	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.3114	26.1766	26.0445	25.4241	25.3080	24.7676	24.7676	24.6676	24.9758	25.3080	25.5428	25.7883	(38)
Heat transfer coeff	58.4026	58.2678	58.1357	57.5153	57.3992	56.8589	56.8589	56.7588	57.0670	57.3992	57.6341	57.8796	(39)
Average = Sum(39)m / 12 =												57.5148	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0716	1.0691	1.0667	1.0553	1.0532	1.0433	1.0433	1.0414	1.0471	1.0532	1.0575	1.0620	(40)
HLP (average)												1.0553	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.8227 (42)
Average daily hot water use (litres/day)		77.4890 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	85.2379	82.1383	79.0388	75.9392	72.8397	69.7401	69.7401	72.8397	75.9392	79.0388	82.1383	85.2379	(44)
Energy conte	126.4053	110.5549	114.0828	99.4601	95.4343	82.3526	76.3118	87.5689	88.6147	103.2719	112.7294	122.4168	(45)
Energy content (annual)										Total = Sum(45)m =		1219.2036	(45)
Distribution loss (46)m = 0.15 x (45)m	18.9608	16.5832	17.1124	14.9190	14.3152	12.3529	11.4468	13.1353	13.2922	15.4908	16.9094	18.3625	(46)
Water storage loss:													
Store volume												2.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.2388	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.1290	(55)
Total storage loss													

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

	3.9977	3.6109	3.9977	3.8688	3.9977	3.8688	3.9977	3.9977	3.8688	3.9977	3.8688	3.9977 (56)
If cylinder contains dedicated solar storage												
	3.9977	3.6109	3.9977	3.8688	3.9977	3.8688	3.9977	3.9977	3.8688	3.9977	3.8688	3.9977 (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												
	153.6655	135.1770	141.3429	125.8409	122.6945	108.7334	103.5719	114.8290	114.9955	130.5321	139.1102	149.6770 (62)
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												
	153.6655	135.1770	141.3429	125.8409	122.6945	108.7334	103.5719	114.8290	114.9955	130.5321	139.1102	149.6770 (64)
								Total per year (kWh/year) = Sum(64)m =				1540.1698 (64)
Heat gains from water heating, kWh/month												
	63.8379	56.4572	59.7406	54.1751	53.5400	48.4869	47.1818	50.9248	50.5690	56.1460	58.5871	62.5117 (65)

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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	91.1347	91.1347	91.1347	91.1347	91.1347	91.1347	91.1347	91.1347	91.1347	91.1347	91.1347	91.1347	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	14.1983	12.6108	10.2558	7.7643	5.8039	4.8999	5.2945	6.8820	9.2370	11.7285	13.6889	14.5929	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	158.8961	160.5450	156.3899	147.5444	136.3784	125.8840	118.8731	117.2242	121.3793	130.2248	141.3908	151.8852	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	32.1135	32.1135	32.1135	32.1135	32.1135	32.1135	32.1135	32.1135	32.1135	32.1135	32.1135	32.1135	(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)													
	-72.9078	-72.9078	-72.9078	-72.9078	-72.9078	-72.9078	-72.9078	-72.9078	-72.9078	-72.9078	-72.9078	-72.9078	(71)
Water heating gains (Table 5)													
	85.8036	84.0136	80.2965	75.2432	71.9624	67.3429	63.4164	68.4473	70.2348	75.4651	81.3710	84.0211	(72)
Total internal gains													
	312.2384	310.5098	300.2827	283.8923	267.4851	251.4672	240.9244	245.8939	254.1914	270.7588	289.7911	303.8396	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	5.4800	10.6334	0.6300	0.7000	0.7700	17.8084	(74)
Northeast	1.0700	11.2829	0.6300	0.7000	0.7700	3.6896	(75)
Southeast	4.9700	36.7938	0.6300	0.7000	0.7700	55.8860	(77)

Solar gains	77.3840	136.7376	201.6104	276.4969	335.7665	345.2594	327.8724	281.5311	227.0507	154.8999	93.5500	65.6858	(83)
Total gains	389.6224	447.2474	501.8931	560.3892	603.2516	596.7265	568.7967	527.4250	481.2421	425.6588	383.3411	369.5255	(84)

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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	64.8040	64.9539	65.1015	65.8037	65.9368	66.5635	66.5635	66.6808	66.3207	65.9368	65.6682	65.3896	
alpha	5.3203	5.3303	5.3401	5.3869	5.3958	5.4376	5.4376	5.4454	5.4214	5.3958	5.3779	5.3593	
util living area													
	0.9954	0.9898	0.9736	0.9191	0.7878	0.5930	0.4370	0.4895	0.7490	0.9477	0.9900	0.9965	(86)
MIT	19.9730	20.1335	20.3800	20.6828	20.8973	20.9823	20.9972	20.9949	20.9415	20.6605	20.2610	19.9420	(87)
Th 2	20.0241	20.0261	20.0281	20.0375	20.0392	20.0474	20.0474	20.0489	20.0443	20.0392	20.0357	20.0320	(88)
util rest of house													
	0.9940	0.9866	0.9651	0.8940	0.7326	0.5119	0.3439	0.3912	0.6699	0.9258	0.9862	0.9954	(89)
MIT 2	18.6643	18.8987	19.2539	19.6789	19.9448	20.0364	20.0464	20.0469	20.0010	19.6597	19.0923	18.6250	(90)
Living area fraction										fLA = Living area / (4) =		0.4624	(91)
MIT	19.2694	19.4696	19.7746	20.1431	20.3852	20.4738	20.4860	20.4853	20.4359	20.1225	19.6327	19.2339	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2694	19.4696	19.7746	20.1431	20.3852	20.4738	20.4860	20.4853	20.4359	20.1225	19.6327	19.2339	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9924	0.9842	0.9624	0.8971	0.7536	0.5489	0.3871	0.4368	0.7042	0.9281	0.9842	0.9941	(94)
Useful gains	386.6734	440.1748	483.0225	502.7043	454.6279	327.5592	220.1627	230.3874	338.8671	395.0398	377.2728	367.3576	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	874.2531	848.9417	771.7302	646.6511	498.5266	333.9769	220.9547	231.8747	361.5702	546.5821	722.3110	870.1584	(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													
	362.7593	274.6913	214.7985	103.6417	32.6607	0.0000	0.0000	0.0000	0.0000	112.7475	248.4275	374.0838	(98)
Space heating												1723.8103	(98)
Space heating per m2											(98) / (4) =	31.6295	(99)

8c. Space cooling requirement

Not applicable

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												1843.6473	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	362.7593	274.6913	214.7985	103.6417	32.6607	0.0000	0.0000	0.0000	0.0000	112.7475	248.4275	374.0838	(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)													
	387.9779	293.7875	229.7310	110.8467	34.9312	0.0000	0.0000	0.0000	0.0000	120.5855	265.6979	400.0896	(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													
Water heating requirement													
	153.6655	135.1770	141.3429	125.8409	122.6945	108.7334	103.5719	114.8290	114.9955	130.5321	139.1102	149.6770	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.0278	86.6674	85.9274	84.3015	81.8341	79.8000	79.8000	79.8000	79.8000	84.4261	86.3442	87.1602	(217)
Fuel for water heating, kWh/month													
	176.5706	155.9721	164.4911	149.2748	149.9308	136.2574	129.7894	143.8960	144.1047	154.6111	161.1113	171.7263	(219)
Water heating fuel used												1837.7355	(219)
Annual totals kWh/year													
Space heating fuel - main system												1843.6473	(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)												250.7461	(232)
Total delivered energy for all uses												4007.1290	(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	1843.6473	0.2160	398.2278	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1837.7355	0.2160	396.9509	(264)
Space and water heating			795.1787	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	250.7461	0.5190	130.1372	(268)
Total CO2, kg/m2/year			964.2409	(272)
Emissions per m2 for space and water heating			14.5904	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.3878	(272b)
Emissions per m2 for pumps and fans			0.7142	(272c)
Target Carbon Dioxide Emission Rate (TER) = (14.5904 * 1.00) + 2.3878 + 0.7142, rounded to 2 d.p.			17.6900	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	A-1-03	**Issued on Date**	05/02/2020
Assessment Reference	ASHP - Be Lean	**Prop Type Ref**	2bed 3F
Property			

SAP Rating	84 B	**DER**	15.03	**TER**	16.42
Environmental	90 B	**% DER<TER**	8.45		
CO_2 Emissions (t/year)	0.75	**DFEE**	34.79	**TFEE**	40.16
General Requirements Compliance	Fail	**% DFEE<TFEE**	13.37		

Assessor Details	Miss Claudia Cioli, Claudia Cioli, Tel: 07481524839, clacioli@gmail.com	**Assessor ID**	R479-0001
Client			

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

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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England
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DWELLING AS DESIGNED

Mid-floor flat, total floor area 59 m²

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

1a TER and DER
Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 16.42 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 15.03 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)40.2 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)34.8 kWh/m²/yrOK

---
2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.38 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction

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

---
4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage Measured cylinder loss: 0.74 kWh/day
Permitted by DBSCG 0.32 Fail
Primary pipework insulated: No primary pipework

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

Hot water controls: No cylinderstat

---
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: 94%
Minimum: 70% OK

---
9 Summertime temperature
Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing West: 12.20 m², No overhang
Air change rate: 0.50 ach
Blinds/curtains: None

---
10 Key features
Party wall U-value 0.00 W/m²K
Air permeability 3.0 m³/m²h

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	58.5000 (1b)	x	2.5400 (2b)	=	148.5900	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	58.5000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	148.5900	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							0 * 10 =	0.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.0000	
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1163	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation:	0.5000	(23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	79.9000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2487	0.2458	0.2429	0.2284	0.2255	0.2109	0.2109	0.2080	0.2168	0.2255	0.2313	0.2371	(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	
W03 (Uw = 1.40)			8.4000	1.3258	11.1364			(27)
W02 (Uw = 1.40)			3.8000	1.3258	5.0379			(27)
door			2.1000	1.2500	2.6250			(26a)
External Wall 1	37.1000	12.2000	24.9000	0.1500	3.7350	140.0000	3486.0000	(29a)
Corridor wall	25.4000	2.1000	23.3000	0.1409	3.2832	110.0000	2563.0000	(29a)
Total net area of external elements Aum(A, m2)			62.5000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.8175			(33)
Party Wall 1			22.6000	0.0000	0.0000	140.0000	3164.0000	(32)
Party Floor 1			58.5000			40.0000	2340.0000	(32d)
Party Ceilings			58.5000			80.0000	4680.0000	(32b)
Internal Wall			77.4000			9.0000	696.6000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 16929.6000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	289.3949	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	4.0072	(36)
Total fabric heat loss	(33) + (36) = 29.8247	(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	12.1958	12.0533	11.9108	11.1983	11.0558	10.3433	10.3433	10.2007	10.6283	11.0558	11.3408	11.6258	(38)
Heat transfer coeff	42.0205	41.8780	41.7355	41.0230	40.8805	40.1679	40.1679	40.0254	40.4529	40.8805	41.1655	41.4505	(39)
Average = Sum(39)m / 12 =												40.9873	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7183	0.7159	0.7134	0.7012	0.6988	0.6866	0.6866	0.6842	0.6915	0.6988	0.7037	0.7086	(40)
HLP (average)												0.7006	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.9389 (42)
Average daily hot water use (litres/day)	84.4730 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	92.9203	89.5414	86.1625	82.7836	79.4046	76.0257	76.0257	79.4046	82.7836	86.1625	89.5414	92.9203	(44)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy conte	137.7982	120.5191	124.3650	108.4244	104.0358	89.7750	83.1897	95.4614	96.6015	112.5798	122.8896	133.4502	(45)
Energy content (annual)										Total = Sum(45)m =		1329.0895	(45)
Distribution loss (46)m = 0.15 x (45)m													
	20.6697	18.0779	18.6547	16.2637	15.6054	13.4662	12.4785	14.3192	14.4902	16.8870	18.4334	20.0175	(46)
Water storage loss:													
Store volume												2.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.7400	(48)
Temperature factor from Table 2b												1.0000	(49)
Enter (49) or (54) in (55)												0.7400	(55)
Total storage loss													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(56)
If cylinder contains dedicated solar storage													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(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													
	184.0006	162.2503	170.5674	153.1364	150.2382	134.4870	129.3921	141.6638	141.3135	158.7822	167.6016	179.6526	(62)
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													
	184.0006	162.2503	170.5674	153.1364	150.2382	134.4870	129.3921	141.6638	141.3135	158.7822	167.6016	179.6526	(64)
								Total per year (kWh/year) = Sum(64)m =				1873.0855	(64)
Heat gains from water heating, kWh/month													
	82.7798	73.4576	78.3133	71.8207	71.5538	65.6198	64.6225	68.7028	67.8896	74.3947	76.6304	81.3341	(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	96.9460	96.9460	96.9460	96.9460	96.9460	96.9460	96.9460	96.9460	96.9460	96.9460	96.9460	96.9460	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	15.0797	13.3937	10.8925	8.2463	6.1642	5.2041	5.6232	7.3092	9.8104	12.4566	14.5387	15.4988	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	169.1487	170.9039	166.4808	157.0644	145.1780	134.0065	126.5432	124.7879	129.2111	138.6274	150.5138	161.6854	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	32.6946	32.6946	32.6946	32.6946	32.6946	32.6946	32.6946	32.6946	32.6946	32.6946	32.6946	32.6946	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-77.5568	-77.5568	-77.5568	-77.5568	-77.5568	-77.5568	-77.5568	-77.5568	-77.5568	-77.5568	-77.5568	-77.5568	(71)
Water heating gains (Table 5)													
	111.2632	109.3119	105.2598	99.7510	96.1745	91.1386	86.8582	92.3425	94.2911	99.9929	106.4311	109.3200	(72)
Total internal gains													
	347.5754	345.6933	334.7168	317.1455	299.6005	282.4329	271.1084	276.5235	285.3964	303.1607	323.5674	338.5880	(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	8.4000	19.6403	0.3700	0.8900	0.7700	37.6488	(80)
West	3.8000	19.6403	0.5600	0.6800	0.7700	19.6952	(80)

Solar gains	57.3441	112.1772	184.7398	269.4320	330.1990	338.0175	321.8064	276.4269	214.8600	133.1077	71.5013	47.1570	(83)
Total gains	404.9194	457.8704	519.4566	586.5775	629.7995	620.4504	592.9148	552.9505	500.2565	436.2683	395.0688	385.7450	(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	111.9136	112.2944	112.6778	114.6350	115.0346	117.0752	117.0752	117.4920	116.2503	115.0346	114.2381	113.4526	
alpha	8.4609	8.4863	8.5119	8.6423	8.6690	8.8050	8.8050	8.8328	8.7500	8.6690	8.6159	8.5635	
util living area													
	0.9959	0.9877	0.9496	0.8078	0.6006	0.4142	0.2981	0.3330	0.5565	0.8846	0.9869	0.9972	(86)
MIT	20.5419	20.6591	20.8281	20.9653	20.9971	20.9999	21.0000	21.0000	20.9988	20.9396	20.7195	20.5207	(87)
Th 2	20.3247	20.3268	20.3290	20.3397	20.3419	20.3527	20.3527	20.3548	20.3483	20.3419	20.3376	20.3333	(88)
util rest of house													
	0.9946	0.9837	0.9355	0.7737	0.5593	0.3724	0.2542	0.2863	0.5046	0.8513	0.9820	0.9962	(89)
MIT 2	19.7163	19.8868	20.1238	20.3049	20.3395	20.3526	20.3527	20.3548	20.3476	20.2813	19.9838	19.6927	(90)
Living area fraction									fLA = Living area / (4) =			0.4821	(91)
MIT	20.1143	20.2591	20.4633	20.6233	20.6565	20.6646	20.6647	20.6658	20.6615	20.5986	20.3384	20.0919	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1143	20.2591	20.4633	20.6233	20.6565	20.6646	20.6647	20.6658	20.6615	20.5986	20.3384	20.0919	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9940	0.9832	0.9386	0.7888	0.5791	0.3926	0.2754	0.3088	0.5296	0.8650	0.9820	0.9957	(94)
Useful gains	402.5046	450.1909	487.5767	462.6642	364.7469	243.5644	163.2695	170.7376	264.9462	377.3909	387.9459	384.1001	(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													
	664.5234	643.2088	582.7669	480.9227	366.1459	243.6038	163.2709	170.7412	265.4338	408.7480	544.9655	658.7253	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	194.9420	129.7080	70.8215	13.1461	1.0409	0.0000	0.0000	0.0000	0.0000	23.3297	113.0541	204.3211	(98)
Space heating												750.3634	(98)
Space heating per m2											(98) / (4) =	12.8267	(99)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Boilers	1.0000	(303a)
Fraction of total space heat from community Boilers	1.0000	(304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.1000	(306)
Space heating:		
Annual space heating requirement	750.3634	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.10	825.3998	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	1873.0855	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.10	2060.3941	(310a)
Electricity used for heat distribution	28.8579	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.2500, SFP = 0.6625)		
mechanical ventilation fans (SFP = 0.6625)	120.0979	(330a)
Total electricity for the above, kWh/year	120.0979	(331)
Electricity for lighting (calculated in Appendix L)	266.3127	(332)
Total delivered energy for all uses	3272.2044	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Boilers			93.9000	(367a)
Space heating from Boilers	3073.2629	0.2160	663.8248	(367)
Electrical energy for heat distribution	28.8579	0.5190	14.9773	(372)
Total CO2 associated with community systems			678.8021	(373)
(negative value allowed since DFEE <= TFEE)				
Space and water heating			678.8021	(376)
Pumps and fans	120.0979	0.5190	62.3308	(378)
Energy for lighting	266.3127	0.5190	138.2163	(379)
Total CO2, kg/year			879.3491	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			15.0300	(384)

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

DER		15.0300	ZC1
Total Floor Area	TFA	58.5000	
Assumed number of occupants	N	1.9389	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.1340	ZC2
CO2 emissions from cooking, equation (L16)		2.8296	ZC3
Total CO2 emissions		34.9936	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		34.9936	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	58.5000 (1b)	x	2.5400 (2b)	=	148.5900	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	58.5000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	148.5900	(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)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1346	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3846	(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) =	0.2981	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3800	0.3726	0.3651	0.3279	0.3204	0.2832	0.2832	0.2757	0.2981	0.3204	0.3353	0.3502	(22b)
Effective ac	0.5722	0.5694	0.5667	0.5537	0.5513	0.5401	0.5401	0.5380	0.5444	0.5513	0.5562	0.5613	(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 Semi-glazed door			2.1000	1.2000	2.5200			(26a)
TER Opening Type (Uw = 1.40)			12.2000	1.3258	16.1742			(27)
External Wall 1	37.1000	12.2000	24.9000	0.1800	4.4820			(29a)
Corridor wall	25.4000	2.1000	23.3000	0.1800	4.1940			(29a)
Total net area of external elements Aum(A, m2)			62.5000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.3702			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							2.7572	(36)
Total fabric heat loss					(33) + (36) =		30.1274	(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	28.0582	27.9207	27.7860	27.1529	27.0345	26.4832	26.4832	26.3810	26.6955	27.0345	27.2741	27.5246	(38)
Heat transfer coeff	58.1857	58.0482	57.9134	57.2804	57.1619	56.6106	56.6106	56.5085	56.8230	57.1619	57.4015	57.6520	(39)
Average = Sum(39)m / 12 =												57.2798	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9946	0.9923	0.9900	0.9792	0.9771	0.9677	0.9677	0.9660	0.9713	0.9771	0.9812	0.9855	(40)
HLP (average)												0.9791	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.9389	(42)
Average daily hot water use (litres/day)	80.2494	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	88.2743	85.0643	81.8544	78.6444	75.4344	72.2244	72.2244	75.4344	78.6444	81.8544	85.0643	88.2743	(44)
Energy conte	130.9082	114.4932	118.1467	103.0032	98.8340	85.2862	79.0302	90.6883	91.7714	106.9508	116.7451	126.7776	(45)
Energy content (annual)										Total = Sum(45)m =		1262.6351	(45)
Distribution loss (46)m = 0.15 x (45)m	19.6362	17.1740	17.7220	15.4505	14.8251	12.7929	11.8545	13.6033	13.7657	16.0426	17.5118	19.0166	(46)

Water storage loss:		
Store volume	2.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	0.2388	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.1290	(55)
Total storage loss		

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

	3.9977	3.6109	3.9977	3.8688	3.9977	3.8688	3.9977	3.9977	3.8688	3.9977	3.8688	3.9977 (56)
If cylinder contains dedicated solar storage												
	3.9977	3.6109	3.9977	3.8688	3.9977	3.8688	3.9977	3.9977	3.8688	3.9977	3.8688	3.9977 (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												
	158.1684	139.1153	145.4069	129.3840	126.0941	111.6670	106.2904	117.9485	118.1522	134.2109	143.1259	154.0378 (62)
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												
	158.1684	139.1153	145.4069	129.3840	126.0941	111.6670	106.2904	117.9485	118.1522	134.2109	143.1259	154.0378 (64)
								Total per year (kWh/year) = Sum(64)m =				1583.6013 (64)
Heat gains from water heating, kWh/month												
	65.3351	57.7666	61.0919	55.3532	54.6704	49.4623	48.0857	51.9620	51.6186	57.3692	59.9224	63.9617 (65)

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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	96.9460	96.9460	96.9460	96.9460	96.9460	96.9460	96.9460	96.9460	96.9460	96.9460	96.9460	96.9460	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	15.1287	13.4372	10.9279	8.2731	6.1842	5.2210	5.6415	7.3330	9.8423	12.4971	14.5860	15.5492	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	169.1487	170.9039	166.4808	157.0644	145.1780	134.0065	126.5432	124.7879	129.2111	138.6274	150.5138	161.6854	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	32.6946	32.6946	32.6946	32.6946	32.6946	32.6946	32.6946	32.6946	32.6946	32.6946	32.6946	32.6946	(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)													
	-77.5568	-77.5568	-77.5568	-77.5568	-77.5568	-77.5568	-77.5568	-77.5568	-77.5568	-77.5568	-77.5568	-77.5568	(71)
Water heating gains (Table 5)													
	87.8160	85.9623	82.1128	76.8794	73.4817	68.6976	64.6313	69.8414	71.6925	77.1092	83.2255	85.9700	(72)
Total internal gains													
	327.1772	325.3872	314.6052	297.3008	279.9278	263.0089	251.8997	257.0461	265.8298	283.3175	303.4091	318.2884	(73)

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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	12.2000	19.6403	0.6300	0.7000	0.7700	73.2283	(80)

Solar gains	73.2283	143.2501	235.9125	344.0643	421.6637	431.6479	410.9464	352.9969	274.3760	169.9783	91.3071	60.2194	(83)
Total gains	400.4055	468.6373	550.5177	641.3651	701.5916	694.6568	662.8461	610.0430	540.2058	453.2958	394.7162	378.5078	(84)

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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	69.8196	69.9850	70.1478	70.9231	71.0700	71.7622	71.7622	71.8919	71.4940	71.0700	70.7734	70.4659	
alpha	5.6546	5.6657	5.6765	5.7282	5.7380	5.7841	5.7841	5.7928	5.7663	5.7380	5.7182	5.6977	
util living area													
	0.9961	0.9899	0.9667	0.8823	0.7135	0.5157	0.3750	0.4243	0.6904	0.9403	0.9909	0.9971	(86)
MIT	20.0535	20.2220	20.4914	20.7892	20.9486	20.9933	20.9991	20.9982	20.9683	20.7211	20.3263	20.0217	(87)
Th 2	20.0878	20.0898	20.0917	20.1007	20.1024	20.1103	20.1103	20.1118	20.1073	20.1024	20.0990	20.0954	(88)
util rest of house													
	0.9948	0.9868	0.9565	0.8515	0.6580	0.4466	0.2996	0.3434	0.6146	0.9168	0.9875	0.9962	(89)
MIT 2	18.8288	19.0747	19.4606	19.8691	20.0571	20.1062	20.1100	20.1111	20.0846	19.7927	19.2344	18.7881	(90)
Living area fraction										fLA = Living area / (4) =		0.4821	(91)
MIT	19.4192	19.6278	19.9575	20.3126	20.4869	20.5338	20.5386	20.5387	20.5106	20.2402	19.7608	19.3827	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4192	19.6278	19.9575	20.3126	20.4869	20.5338	20.5386	20.5387	20.5106	20.2402	19.7608	19.3827	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9936	0.9847	0.9547	0.8594	0.6825	0.4798	0.3360	0.3825	0.6500	0.9209	0.9858	0.9952	(94)
Useful gains	397.8464	461.4833	525.6024	551.1703	478.8403	333.3036	222.6952	233.3149	351.1260	417.4595	389.1258	376.6914	(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													
	879.7202	854.9202	779.3700	653.7200	502.2740	335.9174	222.9665	233.8742	364.2687	551.0533	726.7470	875.3156	(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													
	358.5140	264.3896	188.8031	73.8358	17.4347	0.0000	0.0000	0.0000	0.0000	99.3938	243.0872	370.9764	(98)
Space heating												1616.4346	(98)
Space heating per m2											(98) / (4) =	27.6314	(99)

8c. Space cooling requirement

Not applicable

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												1728.8070	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	358.5140	264.3896	188.8031	73.8358	17.4347	0.0000	0.0000	0.0000	0.0000	99.3938	243.0872	370.9764	(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)													
	383.4375	282.7696	201.9284	78.9687	18.6468	0.0000	0.0000	0.0000	0.0000	106.3036	259.9863	396.7662	(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													
	158.1684	139.1153	145.4069	129.3840	126.0941	111.6670	106.2904	117.9485	118.1522	134.2109	143.1259	154.0378	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.9317	86.5012	85.5115	83.3819	80.9628	79.8000	79.8000	79.8000	79.8000	84.0270	86.2159	87.0745	(217)
Fuel for water heating, kWh/month													
	181.9455	160.8246	170.0436	155.1704	155.7433	139.9336	133.1959	147.8051	148.0604	159.7236	166.0087	176.9035	(219)
Water heating fuel used												1895.3584	(219)
Annual totals kWh/year													
Space heating fuel - main system												1728.8070	(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)												267.1781	(232)
Total delivered energy for all uses												3966.3435	(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	1728.8070	0.2160	373.4223	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1895.3584	0.2160	409.3974	(264)
Space and water heating			782.8197	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	267.1781	0.5190	138.6654	(268)
Total CO2, kg/m2/year			960.4102	(272)
Emissions per m2 for space and water heating			13.3815	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.3703	(272b)
Emissions per m2 for pumps and fans			0.6654	(272c)
Target Carbon Dioxide Emission Rate (TER) = (13.3815 * 1.00) + 2.3703 + 0.6654, rounded to 2 d.p.			16.4200	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	A-1-07	**Issued on Date**	05/02/2020
Assessment Reference	ASHP - Be lean	**Prop Type Ref**	2bed 3F
Property			

SAP Rating	82 B	**DER**	18.93	**TER**	19.36
Environmental	88 B	**% DER<TER**	2.24		
CO_2 Emissions (t/year)	0.87	**DFEE**	49.09	**TFEE**	53.02
General Requirements Compliance	Fail	**% DFEE<TFEE**	7.42		

Assessor Details	Miss Claudia Cioli, Claudia Cioli, Tel: 07481524839, clacioli@gmail.com	**Assessor ID**	R479-0001
Client			

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

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DWELLING AS DESIGNED

Mid-floor flat, total floor area 55 m²

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

1a TER and DER
Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 19.36 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 18.93 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)53.0 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)49.1 kWh/m²/yrOK

---
2 Fabric U-values

Element	Average	Highest	
External wall	0.14 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.11 (max. 0.25)	0.11 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction

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

---
4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage Measured cylinder loss: 0.74 kWh/day
Permitted by DBSCG 0.32 Fail
Primary pipework insulated: No primary pipework

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

Hot water controls: No cylinderstat

---
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: 94%
Minimum: 70% OK

---
9 Summertime temperature
Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing North: 8.40 m², No overhang
Windows facing North East: 1.64 m², No overhang
Windows facing South East: 7.61 m², No overhang
Air change rate: 0.50 ach
Blinds/curtains: None

---
10 Key features
Party wall U-value 0.00 W/m²K
Exposed floor U-value 0.11 W/m²K
Air permeability 3.0 m³/m²h

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	54.5000 (1b)	x	2.5400 (2b)	=	138.4300	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	54.5000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	138.4300	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							0 * 10 =	0.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.0000	
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1163	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation:	0.5000	(23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	79.9000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2487	0.2458	0.2429	0.2284	0.2255	0.2109	0.2109	0.2080	0.2168	0.2255	0.2313	0.2371	(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	
W05 (Uw = 1.40)			1.6400	1.3258	2.1742			(27)
W03 (Uw = 1.40)			8.4000	1.3258	11.1364			(27)
W02 (Uw = 1.40)			7.6100	1.3258	10.0890			(27)
door			2.1000	1.4000	2.9400			(26a)
Heat Loss Floor 1			54.5000	0.1100	5.9950			(28b)
External Wall 1	32.4000	17.6500	14.7500	0.1500	2.2125	140.0000	2065.0000	(29a)
Corridor wall	43.3000	2.1000	41.2000	0.1409	5.8055	110.0000	4532.0000	(29a)
Total net area of external elements Aum(A, m2)			130.2000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.3527			(33)
Party Wall 1			19.4000	0.0000	0.0000	140.0000	2716.0000	(32)
Party Ceilings			54.5000			80.0000	4360.0000	(32b)
Internal Wall			73.4000			9.0000	660.6000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 14333.6000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	263.0018	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	5.2116	(36)
Total fabric heat loss	(33) + (36) = 45.5643	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	11.3619	11.2292	11.0964	10.4326	10.2998	9.6360	9.6360	9.5033	9.9016	10.2998	10.5654	10.8309	(38)
Heat transfer coeff	56.9262	56.7934	56.6607	55.9969	55.8641	55.2003	55.2003	55.0675	55.4658	55.8641	56.1296	56.3952	(39)
Average = Sum(39)m / 12 =												55.9637	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0445	1.0421	1.0396	1.0275	1.0250	1.0128	1.0128	1.0104	1.0177	1.0250	1.0299	1.0348	(40)
HLP (average)												1.0269	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.8227 (42)
Average daily hot water use (litres/day)	81.5674 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	89.7241	86.4614	83.1987	79.9360	76.6733	73.4106	73.4106	76.6733	79.9360	83.1987	86.4614	89.7241	(44)
Energy conte	133.0582	116.3736	120.0871	104.6949	100.4572	86.6869	80.3282	92.1778	93.2787	108.7073	118.6625	128.8598	(45)
Energy content (annual)										Total = Sum(45)m =		1283.3722	(45)
Distribution loss (46)m = 0.15 x (45)m													
	19.9587	17.4560	18.0131	15.7042	15.0686	13.0030	12.0492	13.8267	13.9918	16.3061	17.7994	19.3290	(46)
Water storage loss:													
Store volume												2.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.7400	(48)
Temperature factor from Table 2b												1.0000	(49)
Enter (49) or (54) in (55)												0.7400	(55)
Total storage loss													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(56)
If cylinder contains dedicated solar storage													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(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													
	179.2606	158.1048	166.2895	149.4069	146.6596	131.3989	126.5306	138.3802	137.9907	154.9097	163.3745	175.0622	(62)
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													
	179.2606	158.1048	166.2895	149.4069	146.6596	131.3989	126.5306	138.3802	137.9907	154.9097	163.3745	175.0622	(64)
									Total per year (kWh/year) = Sum(64)m =			1827.3682	(64)
Heat gains from water heating, kWh/month													
	81.2038	72.0792	76.8909	70.5806	70.3639	64.5930	63.6710	67.6110	66.7848	73.1071	75.2249	79.8078	(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	91.1347	91.1347	91.1347	91.1347	91.1347	91.1347	91.1347	91.1347	91.1347	91.1347	91.1347	91.1347	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	14.1657	12.5819	10.2323	7.7465	5.7906	4.8887	5.2824	6.8662	9.2158	11.7016	13.6575	14.5594	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	158.8961	160.5450	156.3899	147.5444	136.3784	125.8840	118.8731	117.2242	121.3793	130.2248	141.3908	151.8852	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	32.1135	32.1135	32.1135	32.1135	32.1135	32.1135	32.1135	32.1135	32.1135	32.1135	32.1135	32.1135	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-72.9078	-72.9078	-72.9078	-72.9078	-72.9078	-72.9078	-72.9078	-72.9078	-72.9078	-72.9078	-72.9078	-72.9078	(71)
Water heating gains (Table 5)													
	109.1449	107.2607	103.3480	98.0287	94.5752	89.7125	85.5794	90.8750	92.7566	98.2622	104.4790	107.2686	(72)
Total internal gains													
	332.5471	330.7279	320.3106	303.6599	287.0846	270.8256	260.0752	265.3059	273.6921	290.5291	309.8677	324.0536	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	1.6400	11.2829	0.3700	0.7900	0.7700	3.7482	(75)
North	8.4000	10.6334	0.3700	0.8900	0.7700	20.3834	(74)
Southeast	7.6100	36.7938	0.5600	0.6800	0.7700	73.8907	(77)

Solar gains	98.0223	172.4466	252.1496	342.2747	412.5714	422.9506	402.1702	347.3383	282.8027	194.7990	118.3658	83.2886	(83)
Total gains	430.5694	503.1745	572.4601	645.9346	699.6560	693.7762	662.2454	612.6442	556.4948	485.3280	428.2335	407.3422	(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	69.9424	70.1059	70.2702	71.1032	71.2722	72.1293	72.1293	72.3031	71.7840	71.2722	70.9350	70.6010	
alpha	5.6628	5.6737	5.6847	5.7402	5.7515	5.8086	5.8086	5.8202	5.7856	5.7515	5.7290	5.7067	
util living area													
	0.9938	0.9845	0.9573	0.8712	0.7027	0.5042	0.3661	0.4120	0.6610	0.9168	0.9852	0.9954	(86)
MIT	20.1185	20.2932	20.5383	20.8058	20.9528	20.9941	20.9992	20.9985	20.9748	20.7698	20.3942	20.0845	(87)
Th 2	20.0464	20.0484	20.0504	20.0605	20.0625	20.0726	20.0726	20.0747	20.0686	20.0625	20.0585	20.0545	(88)
util rest of house													
	0.9918	0.9796	0.9442	0.8372	0.6444	0.4335	0.2893	0.3299	0.5826	0.8857	0.9797	0.9938	(89)
MIT 2	18.8872	19.1406	19.4887	19.8520	20.0222	20.0692	20.0724	20.0741	20.0516	19.8178	19.2962	18.8439	(90)
Living area fraction									fLA = Living area / (4) =			0.4624	(91)
MIT	19.4565	19.6735	19.9740	20.2930	20.4525	20.4969	20.5009	20.5016	20.4785	20.2580	19.8039	19.4175	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4565	19.6735	19.9740	20.2930	20.4525	20.4969	20.5009	20.5016	20.4785	20.2580	19.8039	19.4175	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9901	0.9772	0.9430	0.8463	0.6694	0.4661	0.3248	0.3680	0.6181	0.8930	0.9778	0.9925	(94)
Useful gains	426.3166	491.7265	539.8231	546.6573	468.3686	323.3670	215.1203	225.4336	343.9566	433.4008	418.7113	404.2767	(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													
	862.8018	839.0397	763.4457	637.9732	488.9507	325.5098	215.3333	225.8625	353.7873	539.5339	713.0660	858.1947	(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													
	324.7450	233.3945	166.3752	65.7474	15.3131	0.0000	0.0000	0.0000	0.0000	78.9630	211.9354	337.7150	(98)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Space heating		1434.1887 (98)
Space heating per m2	(98) / (4) =	26.3154 (99)

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1000 (306)
Space heating:	
Annual space heating requirement	1434.1887 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.10	1577.6075 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1827.3682 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.10	2010.1050 (310a)
Electricity used for heat distribution	35.8771 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.2500, SFP = 0.6625)	
mechanical ventilation fans (SFP = 0.6625)	111.8860 (330a)
Total electricity for the above, kWh/year	111.8860 (331)
Electricity for lighting (calculated in Appendix L)	250.1708 (332)
Total delivered energy for all uses	3949.7694 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Boilers			93.9000	(367a)
Space heating from Boilers	3820.7801	0.2160	825.2885	(367)
Electrical energy for heat distribution	35.8771	0.5190	18.6202	(372)
Total CO2 associated with community systems			843.9087	(373)
(negative value allowed since DFEE <= TFEE)				
Space and water heating			843.9087	(376)
Pumps and fans	111.8860	0.5190	58.0689	(378)
Energy for lighting	250.1708	0.5190	129.8386	(379)
Total CO2, kg/year			1031.8162	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			18.9300	(384)

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

DER		18.9300	ZC1
Total Floor Area	TFA	54.5000	
Assumed number of occupants	N	1.8227	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.2768	ZC2
CO2 emissions from cooking, equation (L16)		2.9861	ZC3
Total CO2 emissions		39.1929	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		39.1929	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	54.5000 (1b)	x	2.5400 (2b)	=	138.4300	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	54.5000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	138.4300	(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)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1445	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3945	(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) =	0.3057	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3898	0.3821	0.3745	0.3363	0.3286	0.2904	0.2904	0.2828	0.3057	0.3286	0.3439	0.3592	(22b)
Effective ac	0.5760	0.5730	0.5701	0.5565	0.5540	0.5422	0.5422	0.5400	0.5467	0.5540	0.5591	0.5645	(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 Semi-glazed door			2.1000	1.2000	2.5200			(26a)
TER Opening Type (Uw = 1.40)			11.5200	1.3258	15.2727			(27)
Heat Loss Floor 1			54.5000	0.1300	7.0850			(28b)
External Wall 1	32.4000	11.5200	20.8800	0.1800	3.7584			(29a)
Corridor wall	43.3000	2.1000	41.2000	0.1800	7.4160			(29a)
Total net area of external elements Aum(A, m2)			130.2000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.0521			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	3.1241	(36)
Total fabric heat loss (33) + (36) =	39.1762	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.3114	26.1766	26.0445	25.4241	25.3080	24.7676	24.7676	24.6676	24.9758	25.3080	25.5428	25.7883	(38)
Heat transfer coeff	65.4876	65.3528	65.2207	64.6003	64.4842	63.9439	63.9439	63.8438	64.1520	64.4842	64.7191	64.9646	(39)
Average = Sum(39)m / 12 =												64.5998	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2016	1.1991	1.1967	1.1853	1.1832	1.1733	1.1733	1.1714	1.1771	1.1832	1.1875	1.1920	(40)
HLP (average)												1.1853	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.8227	(42)
Average daily hot water use (litres/day)	77.4890	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	85.2379	82.1383	79.0388	75.9392	72.8397	69.7401	69.7401	72.8397	75.9392	79.0388	82.1383	85.2379	(44)
Energy conte	126.4053	110.5549	114.0828	99.4601	95.4343	82.3526	76.3118	87.5689	88.6147	103.2719	112.7294	122.4168	(45)
Energy content (annual)										Total = Sum(45)m =		1219.2036	(45)
Distribution loss (46)m = 0.15 x (45)m	18.9608	16.5832	17.1124	14.9190	14.3152	12.3529	11.4468	13.1353	13.2922	15.4908	16.9094	18.3625	(46)

Water storage loss:		
Store volume	2.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	0.2388	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.1290	(55)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss
3.9977 3.6109 3.9977 3.8688 3.9977 3.8688 3.9977 3.9977 3.8688 3.9977 3.8688 3.9977 (56)
If cylinder contains dedicated solar storage
3.9977 3.6109 3.9977 3.8688 3.9977 3.8688 3.9977 3.9977 3.8688 3.9977 3.8688 3.9977 (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
153.6655 135.1770 141.3429 125.8409 122.6945 108.7334 103.5719 114.8290 114.9955 130.5321 139.1102 149.6770 (62)
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
153.6655 135.1770 141.3429 125.8409 122.6945 108.7334 103.5719 114.8290 114.9955 130.5321 139.1102 149.6770 (64)
Total per year (kWh/year) = Sum(64)m = 1540.1698 (64)
Heat gains from water heating, kWh/month
63.8379 56.4572 59.7406 54.1751 53.5400 48.4869 47.1818 50.9248 50.5690 56.1460 58.5871 62.5117 (65)

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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	91.1347	91.1347	91.1347	91.1347	91.1347	91.1347	91.1347	91.1347	91.1347	91.1347	91.1347	91.1347	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
14.1983 12.6108 10.2558 7.7643 5.8039 4.8999 5.2945 6.8820 9.2370 11.7285 13.6889 14.5929 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
158.8961 160.5450 156.3899 147.5444 136.3784 125.8840 118.8731 117.2242 121.3793 130.2248 141.3908 151.8852 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
32.1135 32.1135 32.1135 32.1135 32.1135 32.1135 32.1135 32.1135 32.1135 32.1135 32.1135 32.1135 (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)
-72.9078 -72.9078 -72.9078 -72.9078 -72.9078 -72.9078 -72.9078 -72.9078 -72.9078 -72.9078 -72.9078 -72.9078 (71)
Water heating gains (Table 5)
85.8036 84.0136 80.2965 75.2432 71.9624 67.3429 63.4164 68.4473 70.2348 75.4651 81.3710 84.0211 (72)
Total internal gains
312.2384 310.5098 300.2827 283.8923 267.4851 251.4672 240.9244 245.8939 254.1914 270.7588 289.7911 303.8396 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	5.4800	10.6334	0.6300	0.7000	0.7700	17.8084	(74)
Northeast	1.0700	11.2829	0.6300	0.7000	0.7700	3.6896	(75)
Southeast	4.9700	36.7938	0.6300	0.7000	0.7700	55.8860	(77)

Solar gains	77.3840	136.7376	201.6104	276.4969	335.7665	345.2594	327.8724	281.5311	227.0507	154.8999	93.5500	65.6858	(83)
Total gains	389.6224	447.2474	501.8931	560.3892	603.2516	596.7265	568.7967	527.4250	481.2421	425.6588	383.3411	369.5255	(84)

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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	57.7930	57.9121	58.0294	58.5867	58.6922	59.1882	59.1882	59.2810	58.9962	58.6922	58.4793	58.2583	
alpha	4.8529	4.8608	4.8686	4.9058	4.9128	4.9459	4.9459	4.9521	4.9331	4.9128	4.8986	4.8839	
util living area	0.9957	0.9910	0.9780	0.9357	0.8284	0.6485	0.4868	0.5428	0.7949	0.9580	0.9912	0.9967	(86)
MIT	19.7952	19.9599	20.2228	20.5594	20.8288	20.9618	20.9924	20.9873	20.8969	20.5498	20.1106	19.7634	(87)
Th 2	19.9187	19.9207	19.9226	19.9318	19.9335	19.9414	19.9414	19.9429	19.9384	19.9335	19.9300	19.9264	(88)
util rest of house	0.9943	0.9880	0.9704	0.9133	0.7738	0.5563	0.3738	0.4251	0.7135	0.9387	0.9877	0.9955	(89)
MIT 2	18.3298	18.5704	18.9507	19.4281	19.7726	19.9173	19.9388	19.9380	19.8601	19.4260	18.7976	18.2888	(90)
Living area fraction									fLA = Living area / (4) =			0.4624	(91)
MIT	19.0074	19.2129	19.5389	19.9512	20.2610	20.4003	20.4259	20.4232	20.3395	19.9456	19.4047	18.9706	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0074	19.2129	19.5389	19.9512	20.2610	20.4003	20.4259	20.4232	20.3395	19.9456	19.4047	18.9706	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9926	0.9854	0.9671	0.9138	0.7920	0.5977	0.4263	0.4798	0.7469	0.9390	0.9854	0.9942	(94)
Useful gains	386.7367	440.6969	485.3604	512.0889	477.7910	356.6914	242.4835	253.0661	359.4495	399.6819	377.7319	367.3677	(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	963.1533	935.3876	850.4056	713.9113	552.0468	370.8910	244.6460	256.8545	400.2780	602.6431	796.3496	959.5682	(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	428.8539	332.4322	271.5936	145.3122	55.2463	0.0000	0.0000	0.0000	0.0000	151.0031	301.4047	440.5971	(98)
Space heating												2126.4432	(98)
Space heating per m2											(98) / (4) =	39.0173	(99)

8c. Space cooling requirement

Not applicable

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												2274.2708	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	428.8539	332.4322	271.5936	145.3122	55.2463	0.0000	0.0000	0.0000	0.0000	151.0031	301.4047	440.5971	(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)													
	458.6673	355.5425	290.4745	155.4141	59.0870	0.0000	0.0000	0.0000	0.0000	161.5007	322.3580	471.2269	(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													
	153.6655	135.1770	141.3429	125.8409	122.6945	108.7334	103.5719	114.8290	114.9955	130.5321	139.1102	149.6770	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.4083	87.1230	86.5287	85.1983	82.8409	79.8000	79.8000	79.8000	79.8000	85.2031	86.8236	87.5242	(217)
Fuel for water heating, kWh/month													
	175.8020	155.1565	163.3480	147.7036	148.1085	136.2574	129.7894	143.8960	144.1047	153.2011	160.2215	171.0122	(219)
Water heating fuel used												1828.6007	(219)
Annual totals kWh/year													
Space heating fuel - main system												2274.2708	(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)												250.7461	(232)
Total delivered energy for all uses												4428.6177	(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	2274.2708	0.2160	491.2425	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1828.6007	0.2160	394.9778	(264)
Space and water heating			886.2203	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	250.7461	0.5190	130.1372	(268)
Total CO2, kg/m2/year			1055.2825	(272)
Emissions per m2 for space and water heating			16.2609	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.3878	(272b)
Emissions per m2 for pumps and fans			0.7142	(272c)
Target Carbon Dioxide Emission Rate (TER) = (16.2609 * 1.00) + 2.3878 + 0.7142, rounded to 2 d.p.			19.3600	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	A-2-01	**Issued on Date**	05/02/2020
Assessment Reference	ASHP - Be lean	**Prop Type Ref**	2bed 3F
Property			

SAP Rating	85 B	**DER**	14.67	**TER**	15.61
Environmental	89 B	**% DER<TER**	6.05		
CO_2 Emissions (t/year)	0.86	**DFEE**	37.14	**TFEE**	40.71
General Requirements Compliance	Fail	**% DFEE<TFEE**	8.76		

Assessor Details	Miss Claudia Cioli, Claudia Cioli, Tel: 07481524839, clacioli@gmail.com	**Assessor ID**	R479-0001
Client			

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

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DWELLING AS DESIGNED

Mid-floor flat, total floor area 71 m²

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

1a TER and DER
Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 15.61 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 14.67 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)40.7 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)37.1 kWh/m²/yrOK

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2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.38 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction

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

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4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None

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5 Cylinder insulation
Hot water storage Measured cylinder loss: 0.74 kWh/day
Permitted by DBSCG 0.32 Fail
Primary pipework insulated: No primary pipework

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6 Controls
Space heating controls: Charging system linked to use of community heating, programmer and TRVsOK

Hot water controls: No cylinderstat

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

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8 Mechanical ventilation
Continuous supply and extract system
Specific fan power: 0.53
Maximum 1.5 OK
MVHR efficiency: 94%
Minimum: 70% OK

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9 Summertime temperature
Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing North East: 1.92 m², No overhang
Windows facing West: 16.01 m², No overhang
Air change rate: 0.50 ach
Blinds/curtains: None

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10 Key features
Party wall U-value 0.00 W/m²K
Air permeability 3.0 m³/m²h

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	70.8000 (1b)	x	2.5400 (2b)	=	179.8320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.8000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	179.8320	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							0 * 10 =	0.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.0000	
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	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) =	79.9000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2631	0.2599	0.2567	0.2408	0.2376	0.2216	0.2216	0.2184	0.2280	0.2376	0.2439	0.2503	(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	
W03 (Uw = 1.40)			8.4000	1.3258	11.1364			(27)
W02 (Uw = 1.40)			7.6100	1.3258	10.0890			(27)
door			2.1000	1.2500	2.6250			(26a)
W10 (Uw = 1.40)			1.9200	1.3258	2.5455			(27)
External Wall 1	54.1000	17.9300	36.1700	0.1500	5.4255	140.0000	5063.8000	(29a)
Corridor wall	9.1000	2.1000	7.0000	0.1409	0.9864	110.0000	770.0000	(29a)
Total net area of external elements Aum(A, m2)			63.2000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.8077			(33)
Party Wall 1			36.5000	0.0000	0.0000	140.0000	5110.0000	(32)
Party Floor			70.8000			80.0000	5664.0000	(32d)
Party Ceilings			70.8000			80.0000	5664.0000	(32b)
Internal Wall			126.6000			9.0000	1139.4000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 23411.2000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	330.6667	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	5.9440	(36)
Total fabric heat loss	(33) + (36) = 38.7517	(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	15.6113	15.4222	15.2330	14.2872	14.0980	13.1522	13.1522	12.9631	13.5306	14.0980	14.4764	14.8547	(38)
Heat transfer coeff	54.3630	54.1739	53.9847	53.0389	52.8498	51.9040	51.9040	51.7148	52.2823	52.8498	53.2281	53.6064	(39)
Average = Sum(39)m / 12 =												52.9916	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7678	0.7652	0.7625	0.7491	0.7465	0.7331	0.7331	0.7304	0.7385	0.7465	0.7518	0.7572	(40)
HLP (average)												0.7485	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2654 (42)
Average daily hot water use (litres/day)	92.6347 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	101.8982	98.1928	94.4874	90.7820	87.0766	83.3713	83.3713	87.0766	90.7820	94.4874	98.1928	101.8982	(44)
Energy conte	151.1121	132.1636	136.3810	118.9003	114.0876	98.4490	91.2274	104.6848	105.9351	123.4571	134.7631	146.3440	(45)
Energy content (annual)										Total = Sum(45)m =		1457.5051	(45)
Distribution loss (46)m = 0.15 x (45)m													
	22.6668	19.8245	20.4572	17.8350	17.1131	14.7673	13.6841	15.7027	15.8903	18.5186	20.2145	21.9516	(46)
Water storage loss:													
Store volume												2.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.7400	(48)
Temperature factor from Table 2b												1.0000	(49)
Enter (49) or (54) in (55)												0.7400	(55)
Total storage loss													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(56)
If cylinder contains dedicated solar storage													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(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													
	197.3145	173.8948	182.5834	163.6123	160.2900	143.1610	137.4298	150.8872	150.6471	169.6595	179.4751	192.5464	(62)
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													
	197.3145	173.8948	182.5834	163.6123	160.2900	143.1610	137.4298	150.8872	150.6471	169.6595	179.4751	192.5464	(64)
								Total per year (kWh/year) = Sum(64)m =				2001.5011	(64)
Heat gains from water heating, kWh/month													
	87.2067	77.3294	82.3086	75.3039	74.8961	68.5039	67.2950	71.7696	70.9930	78.0114	80.5783	85.6213	(65)

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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	113.2695	113.2695	113.2695	113.2695	113.2695	113.2695	113.2695	113.2695	113.2695	113.2695	113.2695	113.2695	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	17.7550	15.7698	12.8249	9.7093	7.2578	6.1273	6.6208	8.6060	11.5509	14.6665	17.1180	18.2485	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	199.1570	201.2236	196.0158	184.9289	170.9337	157.7803	148.9929	146.9263	152.1341	163.2210	177.2161	190.3696	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.3269	34.3269	34.3269	34.3269	34.3269	34.3269	34.3269	34.3269	34.3269	34.3269	34.3269	34.3269	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	(71)
Water heating gains (Table 5)													
	117.2133	115.0735	110.6298	104.5888	100.6667	95.1443	90.4503	96.4645	98.6014	104.8540	111.9143	115.0824	(72)
Total internal gains													
	391.1061	389.0477	376.4513	356.2078	335.8391	316.0327	303.0449	308.9776	319.2673	339.7224	363.2293	380.6813	(73)

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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	8.4000	19.6403	0.3700	0.8900	0.7700	37.6488	(80)
West	7.6100	19.6403	0.5600	0.6800	0.7700	39.4423	(80)
Northeast	1.9200	11.2829	0.3700	0.6500	0.7700	3.6105	(75)

Solar gains	80.7017	158.1560	261.5982	383.9597	473.1374	485.5805	461.7763	394.8582	304.9841	187.9262	100.6666	66.3445	(83)
Total gains	471.8078	547.2037	638.0495	740.1675	808.9765	801.6132	764.8212	703.8358	624.2513	527.6486	463.8959	447.0259	(84)

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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	119.6238	120.0415	120.4621	122.6102	123.0490	125.2913	125.2913	125.7495	124.3846	123.0490	122.1745	121.3122	
alpha	8.9749	9.0028	9.0308	9.1740	9.2033	9.3528	9.3528	9.3833	9.2923	9.2033	9.1450	9.0875	
util living area													
	0.9986	0.9943	0.9665	0.8264	0.6051	0.4143	0.2986	0.3380	0.5764	0.9194	0.9947	0.9991	(86)
MIT	20.5114	20.6327	20.8140	20.9662	20.9978	20.9999	21.0000	21.0000	20.9989	20.9275	20.6877	20.4912	(87)
Th 2	20.2813	20.2836	20.2860	20.2976	20.3000	20.3117	20.3117	20.3140	20.3070	20.3000	20.2953	20.2906	(88)
util rest of house													
	0.9981	0.9921	0.9548	0.7900	0.5606	0.3698	0.2519	0.2876	0.5193	0.8885	0.9922	0.9988	(89)
MIT 2	19.6292	19.8073	20.0645	20.2651	20.2983	20.3117	20.3117	20.3140	20.3064	20.2279	19.8976	19.6076	(90)
Living area fraction									fLA = Living area / (4) =			0.3559	(91)
MIT	19.9432	20.1011	20.3313	20.5146	20.5473	20.5566	20.5567	20.5582	20.5529	20.4769	20.1788	19.9221	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9432	20.1011	20.3313	20.5146	20.5473	20.5566	20.5567	20.5582	20.5529	20.4769	20.1788	19.9221	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9977	0.9914	0.9557	0.8016	0.5764	0.3857	0.2685	0.3055	0.5396	0.8971	0.9917	0.9985	(94)
Useful gains	470.7432	542.4931	609.7647	593.3489	466.3018	309.1474	205.3663	215.0373	336.8621	473.3328	460.0529	446.3649	(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													
	850.4115	823.5030	746.6776	616.0268	467.5772	309.1730	205.3670	215.0395	337.3724	521.9926	696.1603	842.8051	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	282.4732	188.8386	101.8632	16.3281	0.9489	0.0000	0.0000	0.0000	0.0000	36.2029	169.9973	294.9515	(98)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Space heating		1091.6038 (98)
Space heating per m2	(98) / (4) =	15.4181 (99)

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1000 (306)
Space heating:	
Annual space heating requirement	1091.6038 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.10	1200.7641 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2001.5011 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.10	2201.6512 (310a)
Electricity used for heat distribution	34.0242 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.2500, SFP = 0.6625)	
mechanical ventilation fans (SFP = 0.6625)	145.3492 (330a)
Total electricity for the above, kWh/year	145.3492 (331)
Electricity for lighting (calculated in Appendix L)	313.5586 (332)
Total delivered energy for all uses	3861.3232 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Boilers			93.9000	(367a)
Space heating from Boilers	3623.4455	0.2160	782.6642	(367)
Electrical energy for heat distribution	34.0242	0.5190	17.6585	(372)
Total CO2 associated with community systems			800.3228	(373)
(negative value allowed since DFEE <= TFEE)				
Space and water heating			800.3228	(376)
Pumps and fans	145.3492	0.5190	75.4362	(378)
Energy for lighting	313.5586	0.5190	162.7369	(379)
Total CO2, kg/year			1038.4959	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			14.6700	(384)

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

DER		14.6700	ZC1
Total Floor Area	TFA	70.8000	
Assumed number of occupants	N	2.2654	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.6690	ZC2
CO2 emissions from cooking, equation (L16)		2.4487	ZC3
Total CO2 emissions		33.7877	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		33.7877	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	70.8000 (1b)	x	2.5400 (2b)	=	179.8320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.8000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	179.8320	(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							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) =	0.1668	(8)
Pressure test			Yes	
Measured/design AP50			5.0000	
Infiltration rate			0.4168	(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) =		0.3543	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4517	0.4429	0.4340	0.3897	0.3809	0.3366	0.3366	0.3277	0.3543	0.3809	0.3986	0.4163	(22b)
Effective ac	0.6020	0.5981	0.5942	0.5759	0.5725	0.5566	0.5566	0.5537	0.5628	0.5725	0.5794	0.5867	(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 Semi-glazed door			2.1000	1.2000	2.5200			(26a)
TER Opening Type (Uw = 1.40)			15.6000	1.3258	20.6818			(27)
External Wall 1	54.1000	15.6000	38.5000	0.1800	6.9300			(29a)
Corridor wall	9.1000	2.1000	7.0000	0.1800	1.2600			(29a)
Total net area of external elements Aum(A, m2)			63.2000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		31.3918			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							3.8265	(36)
Total fabric heat loss					(33) + (36) =		35.2183	(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	35.7272	35.4921	35.2617	34.1792	33.9766	33.0338	33.0338	32.8592	33.3970	33.9766	34.3863	34.8147	(38)
Heat transfer coeff	70.9456	70.7104	70.4800	69.3975	69.1949	68.2521	68.2521	68.0775	68.6153	69.1949	69.6047	70.0330	(39)
Average = Sum(39)m / 12 =												69.3965	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0021	0.9987	0.9955	0.9802	0.9773	0.9640	0.9640	0.9615	0.9691	0.9773	0.9831	0.9892	(40)
HLP (average)												0.9802	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.2654 (42)
Average daily hot water use (litres/day)		88.0030 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	96.8033	93.2832	89.7631	86.2429	82.7228	79.2027	79.2027	82.7228	86.2429	89.7631	93.2832	96.8033	(44)
Energy conte	143.5565	125.5554	129.5620	112.9552	108.3833	93.5265	86.6661	99.4506	100.6383	117.2843	128.0249	139.0268	(45)
Energy content (annual)										Total = Sum(45)m =		1384.6298	(45)
Distribution loss (46)m = 0.15 x (45)m	21.5335	18.8333	19.4343	16.9433	16.2575	14.0290	12.9999	14.9176	15.0957	17.5926	19.2037	20.8540	(46)

Water storage loss:	
Store volume	2.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	0.2388 (48)
Temperature factor from Table 2b	0.5400 (49)
Enter (49) or (54) in (55)	0.1290 (55)
Total storage loss	

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

	3.9977	3.6109	3.9977	3.8688	3.9977	3.8688	3.9977	3.9977	3.8688	3.9977	3.8688	3.9977	(56)
If cylinder contains dedicated solar storage													
	3.9977	3.6109	3.9977	3.8688	3.9977	3.8688	3.9977	3.9977	3.8688	3.9977	3.8688	3.9977	(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													
	170.8166	150.1775	156.8221	139.3360	135.6434	119.9073	113.9262	126.7107	127.0191	144.5444	154.4057	166.2869	(62)
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													
	170.8166	150.1775	156.8221	139.3360	135.6434	119.9073	113.9262	126.7107	127.0191	144.5444	154.4057	166.2869	(64)
								Total per year (kWh/year) = Sum(64)m =				1705.5960	(64)
Heat gains from water heating, kWh/month													
	69.5406	61.4448	64.8875	58.6622	57.8455	52.2022	50.6246	54.8754	54.5669	60.8051	63.6729	68.0345	(65)

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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	113.2695	113.2695	113.2695	113.2695	113.2695	113.2695	113.2695	113.2695	113.2695	113.2695	113.2695	113.2695	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	17.7603	15.7745	12.8287	9.7121	7.2599	6.1291	6.6228	8.6085	11.5543	14.6709	17.1231	18.2539	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	199.1570	201.2236	196.0158	184.9289	170.9337	157.7803	148.9929	146.9263	152.1341	163.2210	177.2161	190.3696	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.3269	34.3269	34.3269	34.3269	34.3269	34.3269	34.3269	34.3269	34.3269	34.3269	34.3269	34.3269	(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)													
	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	(71)
Water heating gains (Table 5)													
	93.4686	91.4358	87.2143	81.4753	77.7494	72.5030	68.0438	73.7573	75.7873	81.7273	88.4346	91.4443	(72)
Total internal gains													
	370.3667	368.4147	356.0396	336.0972	315.9239	296.3933	283.6403	289.2729	299.4566	319.6000	342.7547	360.0486	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	1.6700	11.2829	0.6300	0.7000	0.7700	5.7585	(75)
West	13.9300	19.6403	0.6300	0.7000	0.7700	83.6123	(80)

Solar gains	89.3708	175.2851	290.4843	427.5366	528.0776	542.5594	515.7156	440.1199	339.0168	208.4065	111.5004	73.4614	(83)
Total gains	459.7375	543.6997	646.5239	763.6339	844.0015	838.9527	799.3559	729.3928	638.4734	528.0066	454.2551	433.5100	(84)

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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	69.3020	69.5324	69.7598	70.8479	71.0553	72.0368	72.0368	72.2216	71.6556	71.0553	70.6370	70.2050	
alpha	5.6201	5.6355	5.6507	5.7232	5.7370	5.8025	5.8025	5.8148	5.7770	5.7370	5.7091	5.6803	
util living area													
	0.9970	0.9918	0.9710	0.8885	0.7169	0.5149	0.3749	0.4275	0.7023	0.9485	0.9929	0.9978	(86)
MIT	20.0097	20.1827	20.4620	20.7793	20.9474	20.9934	20.9991	20.9982	20.9656	20.7003	20.2934	19.9833	(87)
Th 2	20.0816	20.0844	20.0871	20.0999	20.1023	20.1134	20.1134	20.1155	20.1091	20.1023	20.0974	20.0924	(88)
util rest of house													
	0.9960	0.9892	0.9619	0.8587	0.6614	0.4462	0.2998	0.3463	0.6265	0.9275	0.9902	0.9971	(89)
MIT 2	18.7604	19.0138	19.4160	19.8562	20.0557	20.1094	20.1131	20.1148	20.0844	19.7657	19.1859	18.7299	(90)
Living area fraction									fLA = Living area / (4) =			0.3559	(91)
MIT	19.2051	19.4298	19.7883	20.1848	20.3731	20.4241	20.4285	20.4292	20.3981	20.0984	19.5801	19.1760	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2051	19.4298	19.7883	20.1848	20.3731	20.4241	20.4285	20.4292	20.3981	20.0984	19.5801	19.1760	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9947	0.9868	0.9583	0.8618	0.6788	0.4705	0.3266	0.3753	0.6521	0.9274	0.9881	0.9961	(94)
Useful gains	457.3197	536.5045	619.5700	658.0832	572.8788	394.7450	261.0338	273.7189	416.3766	489.6704	448.8341	431.8233	(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													
	1057.4477	1027.4111	936.5568	783.1358	600.1338	397.5050	261.3016	274.2999	432.1429	657.2397	868.6738	1048.8165	(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													
	446.4952	329.8893	235.8382	90.0379	20.2777	0.0000	0.0000	0.0000	0.0000	124.6716	302.2846	459.0429	(98)
Space heating												2008.5374	(98)
Space heating per m2											(98) / (4) =	28.3692	(99)

8c. Space cooling requirement

Not applicable

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												2148.1683	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	446.4952	329.8893	235.8382	90.0379	20.2777	0.0000	0.0000	0.0000	0.0000	124.6716	302.2846	459.0429	(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)													
	477.5350	352.8227	252.2333	96.2972	21.6874	0.0000	0.0000	0.0000	0.0000	133.3386	323.2990	490.9550	(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													
	170.8166	150.1775	156.8221	139.3360	135.6434	119.9073	113.9262	126.7107	127.0191	144.5444	154.4057	166.2869	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.2623	86.8568	85.8999	83.6838	81.0462	79.8000	79.8000	79.8000	79.8000	84.4223	86.5752	87.3842	(217)
Fuel for water heating, kWh/month													
	195.7507	172.9025	182.5637	166.5030	167.3656	150.2598	142.7647	158.7853	159.1718	171.2159	178.3487	190.2940	(219)
Water heating fuel used												2035.9255	(219)
Annual totals kWh/year													
Space heating fuel - main system												2148.1683	(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)												313.6516	(232)
Total delivered energy for all uses												4572.7454	(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	2148.1683	0.2160	464.0044	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2035.9255	0.2160	439.7599	(264)
Space and water heating			903.7643	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	313.6516	0.5190	162.7852	(268)
Total CO2, kg/m2/year			1105.4744	(272)
Emissions per m2 for space and water heating			12.7650	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.2992	(272b)
Emissions per m2 for pumps and fans			0.5498	(272c)
Target Carbon Dioxide Emission Rate (TER) = (12.7650 * 1.00) + 2.2992 + 0.5498, rounded to 2 d.p.			15.6100	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	A-2-04	**Issued on Date**	05/02/2020
Assessment Reference	ASHP - Be lean	**Prop Type Ref**	2bed 3F
Property			

SAP Rating	84 B	**DER**	15.72	**TER**	16.65
Environmental	90 B	**% DER<TER**	5.56		
CO_2 Emissions (t/year)	0.73	**DFEE**	35.89	**TFEE**	39.15
General Requirements Compliance	Fail	**% DFEE<TFEE**	8.32		

Assessor Details	Miss Claudia Cioli, Claudia Cioli, Tel: 07481524839, clacioli@gmail.com	**Assessor ID**	R479-0001
Client			

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

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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England
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DWELLING AS DESIGNED

Mid-floor flat, total floor area 54 m²

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

1a TER and DER
Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 16.65 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 15.72 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)39.1 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)35.9 kWh/m²/yrOK

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2 Fabric U-values

Element	Average	Highest	
External wall	0.14 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction

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

---
4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage Measured cylinder loss: 0.74 kWh/day
Permitted by DBSCG 0.32 Fail
Primary pipework insulated: No primary pipework

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

Hot water controls: No cylinderstat

---
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: 94%
Minimum: 70% OK

---
9 Summertime temperature
Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing North East: 1.64 m², No overhang
Windows facing South East: 12.20 m², No overhang
Air change rate: 0.50 ach
Blinds/curtains: None

---
10 Key features
Party wall U-value 0.00 W/m²K
Air permeability 3.0 m³/m²h

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	54.1000 (1b)	x	2.5400 (2b)	=	137.4140	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	54.1000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	137.4140	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							0 * 10 =	0.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.0000	
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1163	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation:	0.5000	(23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	79.9000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2487	0.2458	0.2429	0.2284	0.2255	0.2109	0.2109	0.2080	0.2168	0.2255	0.2313	0.2371	(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	
W05 (Uw = 1.40)			1.6400	1.3258	2.1742			(27)
W03 (Uw = 1.40)			8.4000	1.3258	11.1364			(27)
W02 (Uw = 1.40)			3.8000	1.3258	5.0379			(27)
door			2.1000	1.4000	2.9400			(26a)
External Wall 1	31.5800	13.8400	17.7400	0.1500	2.6610	140.0000	2483.6000	(29a)
Corridor wall	41.5500	2.1000	39.4500	0.1409	5.5589	110.0000	4339.5000	(29a)
Total net area of external elements Aum(A, m2)			73.1300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.5084			(33)
Party Wall 1			14.9000	0.0000	0.0000	140.0000	2086.0000	(32)
Party Floor			54.1000			80.0000	4328.0000	(32d)
Party Ceilings			54.1000			80.0000	4328.0000	(32b)
Internal Wall			82.3000			9.0000	740.7000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 18305.8000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	338.3697	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	4.1024	(36)
Total fabric heat loss	(33) + (36) = 33.6108	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	11.2786	11.1468	11.0150	10.3560	10.2242	9.5653	9.5653	9.4335	9.8289	10.2242	10.4878	10.7514	(38)
Heat transfer coeff	44.8894	44.7576	44.6258	43.9669	43.8351	43.1761	43.1761	43.0443	43.4397	43.8351	44.0987	44.3622	(39)
Average = Sum(39)m / 12 =												43.9339	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8297	0.8273	0.8249	0.8127	0.8103	0.7981	0.7981	0.7956	0.8030	0.8103	0.8151	0.8200	(40)
HLP (average)												0.8121	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.8109 (42)
Average daily hot water use (litres/day)	81.2736 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	89.4009	86.1500	82.8991	79.6481	76.3972	73.1462	73.1462	76.3972	79.6481	82.8991	86.1500	89.4009	(44)
Energy conte	132.5790	115.9545	119.6546	104.3178	100.0954	86.3747	80.0389	91.8458	92.9427	108.3158	118.2351	128.3957	(45)
Energy content (annual)										Total = Sum(45)m =		1278.7499	(45)
Distribution loss (46)m = 0.15 x (45)m													
	19.8869	17.3932	17.9482	15.6477	15.0143	12.9562	12.0058	13.7769	13.9414	16.2474	17.7353	19.2594	(46)
Water storage loss:													
Store volume												2.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.7400	(48)
Temperature factor from Table 2b												1.0000	(49)
Enter (49) or (54) in (55)												0.7400	(55)
Total storage loss													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(56)
If cylinder contains dedicated solar storage													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(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													
	178.7814	157.6857	165.8570	149.0298	146.2978	131.0867	126.2413	138.0482	137.6547	154.5182	162.9471	174.5981	(62)
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													
	178.7814	157.6857	165.8570	149.0298	146.2978	131.0867	126.2413	138.0482	137.6547	154.5182	162.9471	174.5981	(64)
									Total per year (kWh/year) = Sum(64)m =			1822.7459	(64)
Heat gains from water heating, kWh/month													
	81.0444	71.9398	76.7471	70.4553	70.2436	64.4892	63.5748	67.5006	66.6731	72.9769	75.0828	79.6535	(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	90.5472	90.5472	90.5472	90.5472	90.5472	90.5472	90.5472	90.5472	90.5472	90.5472	90.5472	90.5472	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	14.0736	12.5001	10.1657	7.6961	5.7529	4.8569	5.2480	6.8216	9.1559	11.6255	13.5687	14.4648	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	157.8632	159.5014	155.3733	146.5853	135.4919	125.0657	118.1003	116.4622	120.5902	129.3783	140.4717	150.8979	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	32.0547	32.0547	32.0547	32.0547	32.0547	32.0547	32.0547	32.0547	32.0547	32.0547	32.0547	32.0547	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-72.4377	-72.4377	-72.4377	-72.4377	-72.4377	-72.4377	-72.4377	-72.4377	-72.4377	-72.4377	-72.4377	-72.4377	(71)
Water heating gains (Table 5)													
	108.9307	107.0533	103.1547	97.8545	94.4135	89.5683	85.4501	90.7267	92.6015	98.0872	104.2816	107.0611	(72)
Total internal gains													
	331.0317	329.2189	318.8579	302.3001	285.8225	269.6550	258.9626	264.1746	272.5118	289.2552	308.4862	322.5880	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	1.6400	11.2829	0.3700	0.7900	0.7700	3.7482	(75)
Southeast	8.4000	36.7938	0.3700	0.8900	0.7700	70.5309	(77)
Southeast	3.8000	36.7938	0.5600	0.6800	0.7700	36.8968	(77)

Solar gains	111.1759	190.6188	264.1199	332.8004	377.8235	377.3168	362.8475	328.9180	287.8517	211.5660	133.3899	94.9967	(83)
Total gains	442.2076	519.8376	582.9778	635.1004	663.6460	646.9718	621.8101	593.0926	560.3635	500.8212	441.8761	417.5847	(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	113.2772	113.6108	113.9463	115.6540	116.0017	117.7721	117.7721	118.1327	117.0575	116.0017	115.3084	114.6233	
alpha	8.5518	8.5741	8.5964	8.7103	8.7334	8.8515	8.8515	8.8755	8.8038	8.7334	8.6872	8.6416	
util living area													
	0.9955	0.9823	0.9361	0.8023	0.6109	0.4270	0.3055	0.3338	0.5339	0.8503	0.9830	0.9970	(86)
MIT	20.5601	20.7014	20.8558	20.9680	20.9968	20.9999	21.0000	21.0000	20.9992	20.9572	20.7456	20.5317	(87)
Th 2	20.2276	20.2297	20.2318	20.2423	20.2444	20.2550	20.2550	20.2571	20.2508	20.2444	20.2402	20.2360	(88)
util rest of house													
	0.9937	0.9759	0.9167	0.7625	0.5627	0.3773	0.2538	0.2799	0.4764	0.8071	0.9757	0.9958	(89)
MIT 2	19.6538	19.8572	20.0685	20.2123	20.2421	20.2549	20.2550	20.2571	20.2503	20.2057	19.9307	19.6197	(90)
Living area fraction									fLA = Living area / (4) =			0.5102	(91)
MIT	20.1162	20.2879	20.4702	20.5978	20.6271	20.6350	20.6351	20.6361	20.6324	20.5891	20.3464	20.0850	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1162	20.2879	20.4702	20.5978	20.6271	20.6350	20.6351	20.6361	20.6324	20.5891	20.3464	20.0850	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9933	0.9764	0.9232	0.7817	0.5872	0.4027	0.2802	0.3074	0.5058	0.8277	0.9769	0.9955	(94)
Useful gains	439.2668	507.5836	538.2149	496.4344	389.7194	260.5176	174.2171	182.3366	283.4138	414.5282	431.6691	415.7236	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	709.9781	688.7252	623.4300	514.3150	391.3217	260.5672	174.2187	182.3402	283.7648	437.8717	584.1493	704.6937	(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													
	201.4092	121.7271	63.4001	12.8740	1.1921	0.0000	0.0000	0.0000	0.0000	17.3676	109.7858	214.9937	(98)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Space heating		742.7497 (98)
Space heating per m2	(98) / (4) =	13.7292 (99)

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1000 (306)
Space heating:	
Annual space heating requirement	742.7497 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.10	817.0246 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1822.7459 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.10	2005.0205 (310a)
Electricity used for heat distribution	28.2205 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.2500, SFP = 0.6625)	
mechanical ventilation fans (SFP = 0.6625)	111.0649 (330a)
Total electricity for the above, kWh/year	111.0649 (331)
Electricity for lighting (calculated in Appendix L)	248.5446 (332)
Total delivered energy for all uses	3181.6546 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Boilers			93.9000	(367a)
Space heating from Boilers	3005.3729	0.2160	649.1605	(367)
Electrical energy for heat distribution	28.2205	0.5190	14.6464	(372)
Total CO2 associated with community systems			663.8070	(373)
(negative value allowed since DFEE <= TFEE)				
Space and water heating			663.8070	(376)
Pumps and fans	111.0649	0.5190	57.6427	(378)
Energy for lighting	248.5446	0.5190	128.9946	(379)
Total CO2, kg/year			850.4443	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			15.7200	(384)

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

DER		15.7200	ZC1
Total Floor Area	TFA	54.1000	
Assumed number of occupants	N	1.8109	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.2914	ZC2
CO2 emissions from cooking, equation (L16)		3.0030	ZC3
Total CO2 emissions		36.0144	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		36.0144	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	54.1000 (1b)	x	2.5400 (2b)	=	137.4140	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	54.1000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	137.4140	(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)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1455	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3955	(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) =	0.3065	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3908	0.3832	0.3755	0.3372	0.3295	0.2912	0.2912	0.2836	0.3065	0.3295	0.3449	0.3602	(22b)
Effective ac	0.5764	0.5734	0.5705	0.5569	0.5543	0.5424	0.5424	0.5402	0.5470	0.5543	0.5595	0.5649	(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 Semi-glazed door			2.1000	1.2000	2.5200			(26a)
TER Opening Type (Uw = 1.40)			11.4200	1.3258	15.1402			(27)
External Wall 1	31.5800	11.4200	20.1600	0.1800	3.6288			(29a)
Corridor wall	41.5500	2.1000	39.4500	0.1800	7.1010			(29a)
Total net area of external elements Aum(A, m2)			73.1300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.3900			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	2.4099	(36)
Total fabric heat loss (33) + (36) =	30.7999	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.1369	26.0024	25.8706	25.2514	25.1355	24.5962	24.5962	24.4963	24.8040	25.1355	25.3699	25.6149	(38)
Heat transfer coeff	56.9368	56.8023	56.6705	56.0512	55.9354	55.3961	55.3961	55.2962	55.6038	55.9354	56.1698	56.4148	(39)
Average = Sum(39)m / 12 =												56.0507	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0524	1.0500	1.0475	1.0361	1.0339	1.0240	1.0240	1.0221	1.0278	1.0339	1.0383	1.0428	(40)
HLP (average)												1.0361	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.8109 (42)
Average daily hot water use (litres/day)	77.2099 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	84.9309	81.8425	78.7541	75.6657	72.5773	69.4889	69.4889	72.5773	75.6657	78.7541	81.8425	84.9309	(44)
Energy conte	125.9501	110.1567	113.6719	99.1019	95.0906	82.0560	76.0369	87.2535	88.2956	102.9000	112.3234	121.9759	(45)
Energy content (annual)										Total = Sum(45)m =		1214.8124	(45)
Distribution loss (46)m = 0.15 x (45)m	18.8925	16.5235	17.0508	14.8653	14.2636	12.3084	11.4055	13.0880	13.2443	15.4350	16.8485	18.2964	(46)

Water storage loss:	
Store volume	2.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	0.2388 (48)
Temperature factor from Table 2b	0.5400 (49)
Enter (49) or (54) in (55)	0.1290 (55)
Total storage loss	

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

	3.9977	3.6109	3.9977	3.8688	3.9977	3.8688	3.9977	3.9977	3.8688	3.9977	3.8688	3.9977	(56)
If cylinder contains dedicated solar storage													
	3.9977	3.6109	3.9977	3.8688	3.9977	3.8688	3.9977	3.9977	3.8688	3.9977	3.8688	3.9977	(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													
	153.2102	134.7788	140.9320	125.4827	122.3508	108.4368	103.2971	114.5136	114.6764	130.1601	138.7042	149.2361	(62)
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													
	153.2102	134.7788	140.9320	125.4827	122.3508	108.4368	103.2971	114.5136	114.6764	130.1601	138.7042	149.2361	(64)
								Total per year (kWh/year) = Sum(64)m =				1535.7786	(64)
Heat gains from water heating, kWh/month													
	63.6865	56.3248	59.6040	54.0560	53.4257	48.3882	47.0904	50.8199	50.4629	56.0224	58.4521	62.3651	(65)

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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	90.5472	90.5472	90.5472	90.5472	90.5472	90.5472	90.5472	90.5472	90.5472	90.5472	90.5472	90.5472	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	14.1072	12.5299	10.1900	7.7145	5.7667	4.8685	5.2606	6.8379	9.1778	11.6533	13.6011	14.4993	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	157.8632	159.5014	155.3733	146.5853	135.4919	125.0657	118.1003	116.4622	120.5902	129.3783	140.4717	150.8979	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	32.0547	32.0547	32.0547	32.0547	32.0547	32.0547	32.0547	32.0547	32.0547	32.0547	32.0547	32.0547	(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)													
	-72.4377	-72.4377	-72.4377	-72.4377	-72.4377	-72.4377	-72.4377	-72.4377	-72.4377	-72.4377	-72.4377	-72.4377	(71)
Water heating gains (Table 5)													
	85.6001	83.8166	80.1129	75.0778	71.8088	67.2059	63.2935	68.3063	70.0874	75.2989	81.1835	83.8241	(72)
Total internal gains													
	310.7348	309.0121	298.8404	282.5417	266.2315	250.3042	239.8186	244.7706	253.0195	269.4946	288.4205	302.3854	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	1.3500	11.2829	0.6300	0.7000	0.7700	4.6551	(75)
Southeast	10.0700	36.7938	0.6300	0.7000	0.7700	113.2339	(77)

Solar gains	117.8890	202.3547	280.9776	355.0290	403.9455	403.7883	388.1448	351.2283	306.5565	224.7525	141.4854	100.7062	(83)
Total gains	428.6237	511.3668	579.8181	637.5707	670.1770	654.0925	627.9634	595.9989	559.5760	494.2471	429.9059	403.0916	(84)

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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	65.9845	66.1407	66.2946	67.0270	67.1658	67.8197	67.8197	67.9422	67.5663	67.1658	66.8855	66.5950	
alpha	5.3990	5.4094	5.4196	5.4685	5.4777	5.5213	5.5213	5.5295	5.5044	5.4777	5.4590	5.4397	
util living area													
	0.9925	0.9805	0.9502	0.8703	0.7224	0.5334	0.3869	0.4246	0.6561	0.9055	0.9823	0.9945	(86)
MIT	20.0714	20.2696	20.5210	20.7813	20.9361	20.9900	20.9986	20.9977	20.9707	20.7621	20.3648	20.0317	(87)
Th 2	20.0399	20.0419	20.0439	20.0534	20.0552	20.0634	20.0634	20.0649	20.0602	20.0552	20.0516	20.0478	(88)
util rest of house													
	0.9902	0.9748	0.9359	0.8370	0.6649	0.4592	0.3052	0.3395	0.5783	0.8728	0.9760	0.9927	(89)
MIT 2	18.8187	19.1054	19.4613	19.8157	19.9987	20.0574	20.0629	20.0641	20.0399	19.8018	19.2525	18.7671	(90)
Living area fraction									fLA = Living area / (4) =			0.5102	(91)
MIT	19.4578	19.6993	20.0019	20.3083	20.4769	20.5332	20.5403	20.5403	20.5147	20.2917	19.8200	19.4122	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4578	19.6993	20.0019	20.3083	20.4769	20.5332	20.5403	20.5403	20.5147	20.2917	19.8200	19.4122	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9884	0.9722	0.9352	0.8466	0.6915	0.4968	0.3469	0.3829	0.6169	0.8819	0.9741	0.9912	(94)
Useful gains	423.6362	497.1676	542.2503	539.7970	463.3996	324.9735	217.8579	228.2333	345.2285	435.8674	418.7919	399.5591	(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													
	863.0340	840.6336	765.1601	639.4520	490.9397	328.6744	218.2748	228.9453	356.6840	542.1100	714.4774	858.1954	(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													
	326.9120	230.8091	165.8449	71.7516	20.4898	0.0000	0.0000	0.0000	0.0000	79.0445	212.8935	341.2254	(98)
Space heating												1448.9708	(98)
Space heating per m2											(98) / (4) =	26.7832	(99)

8c. Space cooling requirement

Not applicable

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												1549.7014	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	326.9120	230.8091	165.8449	71.7516	20.4898	0.0000	0.0000	0.0000	0.0000	79.0445	212.8935	341.2254	(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)													
	349.6384	246.8547	177.3742	76.7397	21.9143	0.0000	0.0000	0.0000	0.0000	84.5395	227.6936	364.9469	(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													
	153.2102	134.7788	140.9320	125.4827	122.3508	108.4368	103.2971	114.5136	114.6764	130.1601	138.7042	149.2361	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.7866	86.2371	85.2488	83.3866	81.1767	79.8000	79.8000	79.8000	79.8000	83.5315	85.9534	86.9524	(217)
Fuel for water heating, kWh/month													
	176.5367	156.2886	165.3184	150.4831	150.7215	135.8857	129.4450	143.5008	143.7047	155.8216	161.3714	171.6295	(219)
Water heating fuel used												1840.7068	(219)
Annual totals kWh/year													
Space heating fuel - main system												1549.7014	(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)												249.1383	(232)
Total delivered energy for all uses												3714.5465	(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	1549.7014	0.2160	334.7355	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1840.7068	0.2160	397.5927	(264)
Space and water heating			732.3282	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	249.1383	0.5190	129.3028	(268)
Total CO2, kg/m2/year			900.5560	(272)
Emissions per m2 for space and water heating			13.5366	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.3901	(272b)
Emissions per m2 for pumps and fans			0.7195	(272c)
Target Carbon Dioxide Emission Rate (TER) = (13.5366 * 1.00) + 2.3901 + 0.7195, rounded to 2 d.p.			16.6500	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	A-2-06	**Issued on Date**	05/02/2020
Assessment Reference	ASHP - Be lean	**Prop Type Ref**	2bed 3F
Property			

SAP Rating	85 B	**DER**	14.23	**TER**	14.84
Environmental	89 B	**% DER<TER**	4.14		
CO_2 Emissions (t/year)	1.08	**DFEE**	39.06	**TFEE**	42.75
General Requirements Compliance	Fail	**% DFEE<TFEE**	8.62		

Assessor Details	Miss Claudia Cioli, Claudia Cioli, Tel: 07481524839, clacioli@gmail.com	**Assessor ID**	R479-0001
Client			

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

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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England
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DWELLING AS DESIGNED

Mid-floor flat, total floor area 94 m²

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

1a TER and DER
Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 14.84 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 14.23 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)42.7 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)39.1 kWh/m²/yrOK

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2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.18 (max. 0.20)	0.18 (max. 0.35)	OK
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction

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

---
4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage Measured cylinder loss: 0.74 kWh/day
Permitted by DBSCG 0.32 Fail
Primary pipework insulated: No primary pipework

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

Hot water controls: No cylinderstat

---
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: 94%
Minimum: 70% OK

---
9 Summertime temperature
Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing South East: 7.61 m², No overhang
Windows facing South West: 12.20 m², No overhang
Air change rate: 0.50 ach
Blinds/curtains: None

---
10 Key features
Party wall U-value 0.00 W/m²K
Air permeability 3.0 m³/m²h

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	93.5000 (1b)	x	2.5400 (2b)	=	237.4900	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.5000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	237.4900	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							0 * 10 =	0.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.0000	
Infiltration rate		0.1500	(18)
Number of sides sheltered		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

If mechanical ventilation:	0.5000	(23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	79.9000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2774	0.2739	0.2705	0.2531	0.2497	0.2323	0.2323	0.2288	0.2393	0.2497	0.2566	0.2635	(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	
W03 (Uw = 1.40)			8.4000	1.3258	11.1364			(27)
W02 (Uw = 1.40)			11.4100	1.3258	15.1269			(27)
door			2.1000	1.4000	2.9400			(26a)
External Wall 1	70.4000	19.8100	50.5900	0.1500	7.5885	140.0000	7082.6000	(29a)
Corridor wall	3.8100	2.1000	1.7100	0.1409	0.2410	110.0000	188.1000	(29a)
Exposed ceiling	23.9000		23.9000	0.1800	4.3020	9.0000	215.1000	(30)
Total net area of external elements Aum(A, m2)			98.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		41.3347			(33)
Party Wall 1			42.3000	0.0000	0.0000	140.0000	5922.0000	(32)
Party Floor			93.5000			80.0000	7480.0000	(32d)
Party Ceilings			69.6000			80.0000	5568.0000	(32b)
Internal Wall			79.7000			9.0000	717.3000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 27173.1000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	290.6214	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	16.8632	(36)
Total fabric heat loss	(33) + (36) = 58.1979	(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	21.7408	21.4689	21.1971	19.8378	19.5660	18.2067	18.2067	17.9349	18.7504	19.5660	20.1097	20.6534	(38)
Heat transfer coeff	79.9387	79.6669	79.3950	78.0358	77.7639	76.4046	76.4046	76.1328	76.9483	77.7639	78.3076	78.8513	(39)
Average = Sum(39)m / 12 =												77.9678	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8550	0.8521	0.8491	0.8346	0.8317	0.8172	0.8172	0.8143	0.8230	0.8317	0.8375	0.8433	(40)
HLP (average)												0.8339	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6707 (42)
Average daily hot water use (litres/day)	102.7665 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	113.0432	108.9325	104.8219	100.7112	96.6005	92.4899	92.4899	96.6005	100.7112	104.8219	108.9325	113.0432	(44)
Energy conte	167.6398	146.6188	151.2975	131.9048	126.5658	109.2167	101.2053	116.1346	117.5216	136.9601	149.5026	162.3502	(45)
Energy content (annual)										Total = Sum(45)m =		1616.9178	(45)
Distribution loss (46)m = 0.15 x (45)m													
	25.1460	21.9928	22.6946	19.7857	18.9849	16.3825	15.1808	17.4202	17.6282	20.5440	22.4254	24.3525	(46)
Water storage loss:													
Store volume												2.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.7400	(48)
Temperature factor from Table 2b												1.0000	(49)
Enter (49) or (54) in (55)												0.7400	(55)
Total storage loss													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(56)
If cylinder contains dedicated solar storage													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	213.8422	188.3500	197.4999	176.6168	172.7682	153.9287	147.4077	162.3370	162.2336	183.1625	194.2146	208.5526	(62)
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													
	213.8422	188.3500	197.4999	176.6168	172.7682	153.9287	147.4077	162.3370	162.2336	183.1625	194.2146	208.5526	(64)
								Total per year (kWh/year) = Sum(64)m =				2160.9138	(64)
Heat gains from water heating, kWh/month													
	92.7021	82.1357	87.2683	79.6280	79.0451	72.0841	70.6127	75.5767	74.8455	82.5011	85.4792	90.9434	(65)

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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	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	21.8751	19.4292	15.8009	11.9623	8.9420	7.5492	8.1572	10.6030	14.2313	18.0699	21.0902	22.4830	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	245.3715	247.9177	241.5014	227.8418	210.5991	194.3933	183.5669	181.0207	187.4370	201.0966	218.3393	234.5451	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.3533	36.3533	36.3533	36.3533	36.3533	36.3533	36.3533	36.3533	36.3533	36.3533	36.3533	36.3533	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	(71)
Water heating gains (Table 5)													
	124.5997	122.2258	117.2962	110.5944	106.2434	100.1169	94.9095	101.5815	103.9521	110.8886	118.7211	122.2357	(72)
Total internal gains													
	454.9062	452.6327	437.6584	413.4585	388.8443	365.1193	349.6935	356.2651	368.6804	393.1150	421.2107	442.3237	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	8.4000	36.7938	0.3700	0.8900	0.7700	70.5309	(79)
Southeast	7.6100	36.7938	0.5600	0.6800	0.7700	73.8907	(77)
Southwest	3.8000	36.7938	0.5600	0.6800	0.7700	36.8968	(79)

Solar gains	181.3184	308.8523	422.5852	523.6036	586.4796	582.2385	561.3401	514.4317	457.5704	341.3476	217.1777	155.1708	(83)
Total gains	636.2246	761.4850	860.2436	937.0620	975.3239	947.3578	911.0335	870.6968	826.2508	734.4626	638.3883	597.4945	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	94.4234	94.7456	95.0700	96.7260	97.0641	98.7909	98.7909	99.1437	98.0929	97.0641	96.3902	95.7255	
alpha	7.2949	7.3164	7.3380	7.4484	7.4709	7.5861	7.5861	7.6096	7.5395	7.4709	7.4260	7.3817	
util living area													
	0.9976	0.9909	0.9673	0.8850	0.7192	0.5145	0.3689	0.4020	0.6342	0.9198	0.9920	0.9985	(86)
MIT	20.3455	20.5062	20.7015	20.8922	20.9796	20.9985	20.9999	20.9998	20.9935	20.8751	20.5733	20.3181	(87)
Th 2	20.2060	20.2084	20.2109	20.2234	20.2259	20.2385	20.2385	20.2410	20.2335	20.2259	20.2209	20.2159	(88)
util rest of house													
	0.9968	0.9878	0.9566	0.8542	0.6671	0.4541	0.3051	0.3358	0.5676	0.8902	0.9887	0.9979	(89)
MIT 2	19.3335	19.5683	19.8469	20.1091	20.2090	20.2377	20.2385	20.2409	20.2293	20.0957	19.6769	19.3016	(90)
Living area fraction									fLA = Living area / (4) =			0.3412	(91)
MIT	19.6788	19.8883	20.1385	20.3763	20.4719	20.4972	20.4982	20.4998	20.4901	20.3616	19.9827	19.6484	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6788	19.8883	20.1385	20.3763	20.4719	20.4972	20.4982	20.4998	20.4901	20.3616	19.9827	19.6484	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9960	0.9862	0.9555	0.8607	0.6841	0.4747	0.3269	0.3584	0.5902	0.8960	0.9875	0.9973	(94)
Useful gains	633.7006	750.9716	821.9471	806.5502	667.2318	449.7343	297.8020	312.0508	487.6791	658.0583	630.3805	595.9060	(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													
	1229.3618	1194.0717	1082.8279	895.5615	682.1370	450.5773	297.8435	312.1323	491.7041	759.1003	1008.8158	1218.1267	(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													
	443.1719	297.7632	194.0953	64.0882	11.0894	0.0000	0.0000	0.0000	0.0000	75.1752	272.4735	462.9322	(98)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Space heating		1820.7890 (98)
Space heating per m2	(98) / (4) =	19.4737 (99)

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1000 (306)
Space heating:	
Annual space heating requirement	1820.7890 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.10	2002.8679 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2160.9138 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.10	2377.0052 (310a)
Electricity used for heat distribution	43.7987 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.2500, SFP = 0.6625)	
mechanical ventilation fans (SFP = 0.6625)	191.9513 (330a)
Total electricity for the above, kWh/year	191.9513 (331)
Electricity for lighting (calculated in Appendix L)	386.3202 (332)
Total delivered energy for all uses	4958.1446 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Boilers			93.9000	(367a)
Space heating from Boilers	4664.4016	0.2160	1007.5107	(367)
Electrical energy for heat distribution	43.7987	0.5190	22.7315	(372)
Total CO2 associated with community systems			1030.2423	(373)
(negative value allowed since DFEE <= TFEE)				
Space and water heating			1030.2423	(376)
Pumps and fans	191.9513	0.5190	99.6227	(378)
Energy for lighting	386.3202	0.5190	200.5002	(379)
Total CO2, kg/year			1330.3652	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			14.2300	(384)

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

DER		14.2300	ZC1
Total Floor Area	TFA	93.5000	
Assumed number of occupants	N	2.6707	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		15.5510	ZC2
CO2 emissions from cooking, equation (L16)		1.9582	ZC3
Total CO2 emissions		31.7393	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		31.7393	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	93.5000 (1b)	x	2.5400 (2b)	=	237.4900	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.5000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	237.4900	(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							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) =	0.1263	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3763	(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) =	0.3481	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4438	0.4351	0.4264	0.3829	0.3742	0.3307	0.3307	0.3220	0.3481	0.3742	0.3916	0.4090	(22b)
Effective ac	0.5985	0.5947	0.5909	0.5733	0.5700	0.5547	0.5547	0.5518	0.5606	0.5700	0.5767	0.5836	(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 Semi-glazed door			2.1000	1.2000	2.5200			(26a)
TER Opening Type (Uw = 1.40)			19.8100	1.3258	26.2633			(27)
External Wall 1	70.4000	19.8100	50.5900	0.1800	9.1062			(29a)
Corridor wall	3.8100	2.1000	1.7100	0.1800	0.3078			(29a)
Exposed ceiling	23.9000		23.9000	0.1300	3.1070			(30)
Total net area of external elements Aum(A, m2)			98.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		41.3043			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.5507	(36)
Total fabric heat loss					(33) + (36) =		55.8550	(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	46.9047	46.6049	46.3111	44.9312	44.6730	43.4711	43.4711	43.2485	43.9341	44.6730	45.1953	45.7413	(38)
Heat transfer coeff	102.7596	102.4599	102.1661	100.7861	100.5280	99.3261	99.3261	99.1035	99.7890	100.5280	101.0503	101.5963	(39)
Average = Sum(39)m / 12 =												100.7849	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0990	1.0958	1.0927	1.0779	1.0752	1.0623	1.0623	1.0599	1.0673	1.0752	1.0808	1.0866	(40)
HLP (average)												1.0779	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.6707 (42)
Average daily hot water use (litres/day)		97.6282 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	107.3910	103.4859	99.5808	95.6756	91.7705	87.8654	87.8654	91.7705	95.6756	99.5808	103.4859	107.3910	(44)
Energy conte	159.2578	139.2879	143.7326	125.3096	120.2375	103.7558	96.1450	110.3278	111.6455	130.1121	142.0275	154.2327	(45)
Energy content (annual)										Total = Sum(45)m =		1536.0719	(45)
Distribution loss (46)m = 0.15 x (45)m	23.8887	20.8932	21.5599	18.7964	18.0356	15.5634	14.4218	16.5492	16.7468	19.5168	21.3041	23.1349	(46)
Water storage loss:													
Store volume												2.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.2388	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.1290	(55)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss
3.9977 3.6109 3.9977 3.8688 3.9977 3.8688 3.9977 3.9977 3.8688 3.9977 3.8688 3.9977 (56)
If cylinder contains dedicated solar storage
3.9977 3.6109 3.9977 3.8688 3.9977 3.8688 3.9977 3.9977 3.8688 3.9977 3.8688 3.9977 (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
186.5179 163.9100 170.9928 151.6904 147.4977 130.1366 123.4052 137.5880 138.0263 157.3722 168.4083 181.4928 (62)
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
186.5179 163.9100 170.9928 151.6904 147.4977 130.1366 123.4052 137.5880 138.0263 157.3722 168.4083 181.4928 (64)
Total per year (kWh/year) = Sum(64)m = 1857.0381 (64)
Heat gains from water heating, kWh/month
74.7613 66.0109 69.5992 62.7701 61.7871 55.6034 53.7763 58.4921 58.2268 65.0704 68.3288 73.0905 (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	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
21.9221 19.4710 15.8349 11.9880 8.9612 7.5654 8.1747 10.6258 14.2619 18.1087 21.1356 22.5313 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
245.3715 247.9177 241.5014 227.8418 210.5991 194.3933 183.5669 181.0207 187.4370 201.0966 218.3393 234.5451 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
36.3533 36.3533 36.3533 36.3533 36.3533 36.3533 36.3533 36.3533 36.3533 36.3533 36.3533 36.3533 (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)
-106.8265 -106.8265 -106.8265 -106.8265 -106.8265 -106.8265 -106.8265 -106.8265 -106.8265 -106.8265 -106.8265 -106.8265 (71)
Water heating gains (Table 5)
100.4857 98.2305 93.5473 87.1806 83.0472 77.2270 72.2800 78.6184 80.8705 87.4602 94.9011 98.2399 (72)
Total internal gains
433.8392 431.6791 416.9435 393.0704 368.6674 345.2457 330.0815 336.3248 348.6293 372.7254 400.4359 421.3763 (73)

---
6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	7.6100	36.7938	0.6300	0.7000	0.7700	85.5720	(77)
Southwest	12.2000	36.7938	0.6300	0.7000	0.7700	137.1850	(79)

Solar gains	222.7570	379.4376	519.1630	643.2681	720.5139	715.3035	689.6289	632.0001	562.1437	419.3593	266.8115	190.6336	(83)
Total gains	656.5962	811.1167	936.1065	1036.3386	1089.1813	1060.5492	1019.7105	968.3250	910.7731	792.0848	667.2474	612.0098	(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	63.1868	63.3717	63.5539	64.4241	64.5896	65.3711	65.3711	65.5179	65.0678	64.5896	64.2557	63.9104	
alpha	5.2125	5.2248	5.2369	5.2949	5.3060	5.3581	5.3581	5.3679	5.3379	5.3060	5.2837	5.2607	
util living area	0.9959	0.9874	0.9647	0.9010	0.7709	0.5833	0.4260	0.4664	0.7061	0.9327	0.9896	0.9971	(86)
MIT	19.9231	20.1390	20.4130	20.7092	20.9030	20.9826	20.9973	20.9956	20.9536	20.6877	20.2429	19.8857	(87)
Th 2	20.0016	20.0042	20.0068	20.0189	20.0212	20.0317	20.0317	20.0337	20.0277	20.0212	20.0166	20.0118	(88)
util rest of house	0.9945	0.9834	0.9537	0.8721	0.7138	0.5019	0.3336	0.3707	0.6252	0.9062	0.9857	0.9961	(89)
MIT 2	18.5753	18.8900	19.2826	19.6957	19.9332	20.0210	20.0308	20.0320	19.9946	19.6792	19.0518	18.5282	(90)
Living area fraction									fLA = Living area / (4) =			0.3412	(91)
MIT	19.0351	19.3161	19.6683	20.0414	20.2641	20.3491	20.3605	20.3608	20.3218	20.0233	19.4582	18.9914	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0351	19.3161	19.6683	20.0414	20.2641	20.3491	20.3605	20.3608	20.3218	20.0233	19.4582	18.9914	(93)

---
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9927	0.9798	0.9492	0.8729	0.7289	0.5292	0.3652	0.4035	0.6509	0.9063	0.9827	0.9947	(94)
Useful gains	651.7952	794.7654	888.5331	904.5792	793.9135	561.2855	372.4262	390.6888	592.8344	717.8486	655.6950	608.7824	(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	1514.1781	1477.0764	1345.3491	1122.9037	860.9273	571.0316	373.5175	392.5274	620.8659	947.3010	1248.7950	1502.7473	(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	641.6129	458.5130	339.8711	157.1936	49.8582	0.0000	0.0000	0.0000	0.0000	170.7126	427.0320	665.1099	(98)

Space heating 2909.9033 (98)
Space heating per m2 (98) / (4) = 31.1220 (99)

8c. Space cooling requirement

Not applicable

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												3112.1961	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	641.6129	458.5130	339.8711	157.1936	49.8582	0.0000	0.0000	0.0000	0.0000	170.7126	427.0320	665.1099	(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)													
	686.2170	490.3882	363.4985	168.1215	53.3243	0.0000	0.0000	0.0000	0.0000	182.5804	456.7187	711.3475	(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													
	186.5179	163.9100	170.9928	151.6904	147.4977	130.1366	123.4052	137.5880	138.0263	157.3722	168.4083	181.4928	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.8470	87.4134	86.6128	84.9089	82.2569	79.8000	79.8000	79.8000	79.8000	85.0311	87.1933	87.9713	(217)
Fuel for water heating, kWh/month													
	212.3212	187.5112	197.4220	178.6507	179.3133	163.0785	154.6431	172.4160	172.9653	185.0761	193.1435	206.3092	(219)
Water heating fuel used												2202.8502	(219)
Annual totals kWh/year													
Space heating fuel - main system												3112.1961	(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)												387.1505	(232)
Total delivered energy for all uses												5777.1968	(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	3112.1961	0.2160	672.2343	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2202.8502	0.2160	475.8156	(264)
Space and water heating			1148.0500	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	387.1505	0.5190	200.9311	(268)
Total CO2, kg/m2/year			1387.9061	(272)
Emissions per m2 for space and water heating			12.2786	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.1490	(272b)
Emissions per m2 for pumps and fans			0.4163	(272c)
Target Carbon Dioxide Emission Rate (TER) = (12.2786 * 1.00) + 2.1490 + 0.4163, rounded to 2 d.p.			14.8400	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
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Property Reference	A-3-01	**Issued on Date**	05/02/2020
Assessment Reference	ASHP - Be lean	**Prop Type Ref**	2bed 3F
Property			

SAP Rating	83 B	**DER**	18.46	**TER**	18.55
Environmental	87 B	**% DER<TER**	0.51		
CO_2 Emissions (t/year)	1.07	**DFEE**	51.87	**TFEE**	55.41
General Requirements Compliance	Fail	**% DFEE<TFEE**	6.38		

Assessor Details	Miss Claudia Cioli, Claudia Cioli, Tel: 07481524839, clacioli@gmail.com	**Assessor ID**	R479-0001
Client			

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

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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England
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DWELLING AS DESIGNED

Mid-floor flat, total floor area 71 m²

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

1a TER and DER
Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 18.55 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 18.46 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)55.4 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)51.9 kWh/m²/yrOK

---
2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.18 (max. 0.20)	0.18 (max. 0.35)	OK
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction

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

---
4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage Measured cylinder loss: 0.74 kWh/day
Permitted by DBSCG 0.32 Fail
Primary pipework insulated: No primary pipework

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

Hot water controls: No cylinderstat

---
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: 94%
Minimum: 70% OK

---
9 Summertime temperature
Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing North East: 1.92 m², No overhang
Windows facing North West: 16.01 m², No overhang
Air change rate: 0.50 ach
Blinds/curtains: None

---
10 Key features
Party wall U-value 0.00 W/m²K
Air permeability 3.0 m³/m²h

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	71.2000 (1b)	x	2.4000 (2b)	=	170.8800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.2000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	170.8800	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							0 * 10 =	0.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.0000	
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	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) =	79.9000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2631	0.2599	0.2567	0.2408	0.2376	0.2216	0.2216	0.2184	0.2280	0.2376	0.2439	0.2503	(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	
W10 (Uw = 1.40)			1.9200	1.3258	2.5455			(27)
W03 (Uw = 1.40)			8.4000	1.3258	11.1364			(27)
W02 (Uw = 1.40)			7.6100	1.3258	10.0890			(27)
door			2.1000	1.4000	2.9400			(26a)
External Wall 1	53.7400	17.9300	35.8100	0.1500	5.3715	140.0000	5013.4000	(29a)
Corridor wall	7.8000	2.1000	5.7000	0.1409	0.8032	110.0000	627.0000	(29a)
Exposed ceiling	35.8000		35.8000	0.1800	6.4440	9.0000	322.2000	(30)
Total net area of external elements Aum(A, m2)			97.3400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		39.3295			(33)
Party Wall 1			39.3000	0.0000	0.0000	140.0000	5502.0000	(32)
Party Floor			71.2000			80.0000	5696.0000	(32d)
Party Ceilings			35.4000			80.0000	2832.0000	(32b)
Internal Wall			123.8000			9.0000	1114.2000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 21106.8000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	296.4438	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	15.4420	(36)
Total fabric heat loss	(33) + (36) = 54.7715	(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	14.8342	14.6545	14.4747	13.5760	13.3962	12.4975	12.4975	12.3178	12.8570	13.3962	13.7557	14.1152	(38)
Heat transfer coeff	69.6057	69.4260	69.2462	68.3475	68.1678	67.2690	67.2690	67.0893	67.6285	68.1678	68.5273	68.8867	(39)
Average = Sum(39)m / 12 =												68.3026	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9776	0.9751	0.9726	0.9599	0.9574	0.9448	0.9448	0.9423	0.9498	0.9574	0.9625	0.9675	(40)
HLP (average)												0.9593	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2749 (42)
Average daily hot water use (litres/day)	92.8725 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Daily hot water use													
	102.1598	98.4449	94.7300	91.0151	87.3002	83.5853	83.5853	87.3002	91.0151	94.7300	98.4449	102.1598	(44)
Energy conte	151.5000	132.5029	136.7311	119.2055	114.3805	98.7017	91.4616	104.9536	106.2070	123.7741	135.1091	146.7197	(45)
Energy content (annual)										Total = Sum(45)m =		1461.2468	(45)
Distribution loss (46)m = 0.15 x (45)m													
	22.7250	19.8754	20.5097	17.8808	17.1571	14.8053	13.7192	15.7430	15.9311	18.5661	20.2664	22.0080	(46)
Water storage loss:													
Store volume												2.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.7400	(48)
Temperature factor from Table 2b												1.0000	(49)
Enter (49) or (54) in (55)												0.7400	(55)
Total storage loss													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(56)
If cylinder contains dedicated solar storage													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(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													
	197.7024	174.2341	182.9335	163.9175	160.5829	143.4137	137.6640	151.1560	150.9190	169.9765	179.8211	192.9221	(62)
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													
	197.7024	174.2341	182.9335	163.9175	160.5829	143.4137	137.6640	151.1560	150.9190	169.9765	179.8211	192.9221	(64)
								Total per year (kWh/year) = Sum(64)m =				2005.2428	(64)
Heat gains from water heating, kWh/month													
	87.3357	77.4422	82.4250	75.4054	74.9934	68.5879	67.3729	71.8590	71.0834	78.1168	80.6934	85.7462	(65)

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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	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	17.8374	15.8430	12.8844	9.7543	7.2915	6.1558	6.6515	8.6459	11.6045	14.7346	17.1975	18.3332	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	200.0814	202.1576	196.9256	185.7873	171.7272	158.5126	149.6845	147.6083	152.8403	163.9786	178.0388	191.2533	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	(71)
Water heating gains (Table 5)													
	117.3867	115.2413	110.7863	104.7298	100.7976	95.2610	90.5550	96.5846	98.7270	104.9957	112.0741	115.2503	(72)
Total internal gains													
	392.4290	390.3655	377.7199	357.3949	336.9398	317.0529	304.0146	309.9624	320.2954	340.8325	364.4339	381.9603	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	1.9200	11.2829	0.3700	0.6500	0.7700	3.6105	(75)
Northwest	8.4000	11.2829	0.3700	0.8900	0.7700	21.6285	(81)
Northwest	7.6100	11.2829	0.5600	0.6800	0.7700	22.6588	(81)

Solar gains	47.8979	97.4975	175.6594	288.4833	387.7781	413.4125	386.7389	308.3128	214.0438	119.1496	60.2679	39.1158	(83)
Total gains	440.3269	487.8630	553.3793	645.8782	724.7180	730.4655	690.7535	618.2752	534.3391	459.9821	424.7018	421.0761	(84)

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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	84.2316	84.4497	84.6689	85.7822	86.0084	87.1575	87.1575	87.3910	86.6942	86.0084	85.5572	85.1107	
alpha	6.6154	6.6300	6.6446	6.7188	6.7339	6.8105	6.8105	6.8261	6.7796	6.7339	6.7038	6.6740	
util living area													
	0.9990	0.9977	0.9913	0.9511	0.8057	0.5827	0.4277	0.4970	0.8055	0.9802	0.9975	0.9993	(86)
MIT	20.1456	20.2535	20.4609	20.7478	20.9407	20.9942	20.9994	20.9984	20.9570	20.6938	20.3730	20.1276	(87)
Th 2	20.1020	20.1041	20.1063	20.1169	20.1190	20.1296	20.1296	20.1317	20.1253	20.1190	20.1147	20.1105	(88)
util rest of house													
	0.9986	0.9968	0.9878	0.9321	0.7509	0.5067	0.3436	0.4044	0.7298	0.9691	0.9964	0.9990	(89)
MIT 2	18.9586	19.1178	19.4206	19.8309	20.0674	20.1264	20.1294	20.1312	20.0948	19.7661	19.3009	18.9388	(90)
Living area fraction									fLA = Living area / (4) =			0.3581	(91)
MIT	19.3837	19.5245	19.7932	20.1593	20.3801	20.4372	20.4410	20.4418	20.4036	20.0983	19.6849	19.3646	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3837	19.5245	19.7932	20.1593	20.3801	20.4372	20.4410	20.4418	20.4036	20.0983	19.6849	19.3646	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9981	0.9960	0.9862	0.9332	0.7681	0.5339	0.3738	0.4377	0.7557	0.9688	0.9956	0.9986	(94)
Useful gains	439.5108	485.8899	545.7179	602.7303	556.6845	389.9908	258.1795	270.6102	403.7799	445.6392	422.8262	420.4912	(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													
	1049.9127	1015.3225	920.5031	769.5455	591.7047	392.6608	258.3792	271.1595	426.3039	647.4804	862.4095	1044.6388	(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													

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	454.1390	355.7787	278.8402	120.1070	26.0550	0.0000	0.0000	0.0000	0.0000	150.1699	316.5000	464.3658 (98)
Space heating												2165.9555 (98)
Space heating per m2											(98) / (4) =	30.4207 (99)

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1000 (306)
Space heating:	
Annual space heating requirement	2165.9555 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.10	2382.5510 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2005.2428 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.10	2205.7671 (310a)
Electricity used for heat distribution	45.8832 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.2500, SFP = 0.6625)	
mechanical ventilation fans (SFP = 0.6625)	138.1138 (330a)
Total electricity for the above, kWh/year	138.1138 (331)
Electricity for lighting (calculated in Appendix L)	315.0141 (332)
Total delivered energy for all uses	5041.4460 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Boilers			93.9000	(367a)
Space heating from Boilers	4886.3878	0.2160	1055.4598	(367)
Electrical energy for heat distribution	45.8832	0.5190	23.8134	(372)
Total CO2 associated with community systems			1079.2731	(373)
(negative value allowed since DFEE <= TFEE)				
Space and water heating			1079.2731	(376)
Pumps and fans	138.1138	0.5190	71.6810	(378)
Energy for lighting	315.0141	0.5190	163.4923	(379)
Total CO2, kg/year			1314.4465	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			18.4600	(384)

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

DER		18.4600	ZC1
Total Floor Area	TFA	71.2000	
Assumed number of occupants	N	2.2749	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.6523	ZC2
CO2 emissions from cooking, equation (L16)		2.4382	ZC3
Total CO2 emissions		37.5504	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		37.5504	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	71.2000 (1b)	x	2.4000 (2b)	=	170.8800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.2000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	170.8800	(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							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) =	0.1756	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.4256	(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) =	0.3617	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4612	0.4522	0.4431	0.3979	0.3889	0.3436	0.3436	0.3346	0.3617	0.3889	0.4069	0.4250	(22b)
Effective ac	0.6064	0.6022	0.5982	0.5792	0.5756	0.5590	0.5590	0.5560	0.5654	0.5756	0.5828	0.5903	(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 Semi-glazed door			2.1000	1.2000	2.5200			(26a)
TER Opening Type (Uw = 1.40)			15.7000	1.3258	20.8144			(27)
External Wall 1	53.7400	15.7000	38.0400	0.1800	6.8472			(29a)
Corridor wall	7.8000	2.1000	5.7000	0.1800	1.0260			(29a)
Exposed ceiling	35.8000		35.8000	0.1300	4.6540			(30)
Total net area of external elements Aum(A, m2)			97.3400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		35.8616			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.5745	(36)
Total fabric heat loss					(33) + (36) =		49.4361	(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	34.1925	33.9597	33.7314	32.6592	32.4586	31.5247	31.5247	31.3518	31.8845	32.4586	32.8644	33.2887	(38)
Heat transfer coeff	83.6286	83.3957	83.1675	82.0953	81.8947	80.9608	80.9608	80.7879	81.3205	81.8947	82.3005	82.7248	(39)
Average = Sum(39)m / 12 =												82.0943	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1746	1.1713	1.1681	1.1530	1.1502	1.1371	1.1371	1.1347	1.1421	1.1502	1.1559	1.1619	(40)
HLP (average)												1.1530	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.2749 (42)
Average daily hot water use (litres/day)		88.2289 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	97.0518	93.5227	89.9935	86.4643	82.9352	79.4060	79.4060	82.9352	86.4643	89.9935	93.5227	97.0518	(44)
Energy conte	143.9250	125.8778	129.8946	113.2452	108.6615	93.7666	86.8885	99.7059	100.8967	117.5854	128.3536	139.3837	(45)
Energy content (annual)										Total = Sum(45)m =		1388.1845	(45)
Distribution loss (46)m = 0.15 x (45)m	21.5888	18.8817	19.4842	16.9868	16.2992	14.0650	13.0333	14.9559	15.1345	17.6378	19.2530	20.9076	(46)
Water storage loss:													
Store volume												2.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.2388	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.1290	(55)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss
3.9977 3.6109 3.9977 3.8688 3.9977 3.8688 3.9977 3.9977 3.8688 3.9977 3.8688 3.9977 (56)
If cylinder contains dedicated solar storage
3.9977 3.6109 3.9977 3.8688 3.9977 3.8688 3.9977 3.9977 3.8688 3.9977 3.8688 3.9977 (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
171.1852 150.4998 157.1547 139.6260 135.9216 120.1474 114.1487 126.9660 127.2775 144.8455 154.7344 166.6439 (62)
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
171.1852 150.4998 157.1547 139.6260 135.9216 120.1474 114.1487 126.9660 127.2775 144.8455 154.7344 166.6439 (64)
Total per year (kWh/year) = Sum(64)m = 1709.1507 (64)
Heat gains from water heating, kWh/month
69.6632 61.5520 64.9981 58.7587 57.9381 52.2820 50.6986 54.9603 54.6528 60.9052 63.7822 68.1532 (65)

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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	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	17.8423	15.8474	12.8879	9.7570	7.2935	6.1575	6.6533	8.6483	11.6077	14.7386	17.2022	18.3382	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	200.0814	202.1576	196.9256	185.7873	171.7272	158.5126	149.6845	147.6083	152.8403	163.9786	178.0388	191.2533	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	(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)													
	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	(71)
Water heating gains (Table 5)													
	93.6333	91.5952	87.3630	81.6093	77.8737	72.6139	68.1432	73.8714	75.9066	81.8619	88.5864	91.6038	(72)
Total internal gains													
	371.6805	369.7238	357.3001	337.2771	317.0179	297.4076	284.6046	290.2515	300.4782	320.7027	343.9508	361.3188	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	1.6800	11.2829	0.6300	0.7000	0.7700	5.7930	(75)
Northwest	14.0200	11.2829	0.6300	0.7000	0.7700	48.3440	(81)

Solar gains	54.1370	110.1973	198.5405	326.0606	438.2894	467.2629	437.1149	348.4731	241.9248	134.6699	68.1183	44.2110	(83)
Total gains	425.8175	479.9211	555.8406	663.3377	755.3074	764.6705	721.7195	638.7246	542.4029	455.3726	412.0691	405.5297	(84)

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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	59.1238	59.2889	59.4517	60.2281	60.3756	61.0720	61.0720	61.2028	60.8019	60.3756	60.0779	59.7698	
alpha	4.9416	4.9526	4.9634	5.0152	5.0250	5.0715	5.0715	5.0802	5.0535	5.0250	5.0052	4.9847	
util living area													
	0.9980	0.9961	0.9883	0.9519	0.8375	0.6441	0.4865	0.5657	0.8486	0.9795	0.9961	0.9985	(86)
MIT	19.7241	19.8639	20.1368	20.5229	20.8298	20.9661	20.9933	20.9864	20.8668	20.4649	20.0335	19.7037	(87)
Th 2	19.9404	19.9430	19.9456	19.9578	19.9600	19.9707	19.9707	19.9726	19.9666	19.9600	19.9554	19.9506	(88)
util rest of house													
	0.9974	0.9947	0.9841	0.9342	0.7849	0.5542	0.3764	0.4475	0.7770	0.9690	0.9945	0.9980	(89)
MIT 2	18.2415	18.4474	18.8456	19.4015	19.7985	19.9492	19.9683	19.9672	19.8590	19.3317	18.7045	18.2190	(90)
Living area fraction									fLA = Living area / (4) =			0.3581	(91)
MIT	18.7725	18.9547	19.3081	19.8031	20.1679	20.3134	20.3354	20.3322	20.2199	19.7375	19.1805	18.7507	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7725	18.9547	19.3081	19.8031	20.1679	20.3134	20.3354	20.3322	20.2199	19.7375	19.1805	18.7507	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9963	0.9929	0.9807	0.9310	0.7965	0.5853	0.4161	0.4901	0.7969	0.9660	0.9928	0.9971	(94)
Useful gains	424.2329	476.5016	545.0880	617.5752	601.5932	447.5745	300.2753	313.0120	432.2517	439.9051	409.1169	404.3412	(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													
	1210.3168	1172.1049	1065.2150	895.0937	693.4728	462.5635	302.4191	317.6734	497.6762	748.3153	994.2308	1203.7058	(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													
	584.8464	467.4454	386.9745	199.8133	68.3585	0.0000	0.0000	0.0000	0.0000	229.4572	421.2820	594.7272	(98)
Space heating												2952.9046	(98)
Space heating per m2											(98) / (4) =	41.4734	(99)

8c. Space cooling requirement

Not applicable

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												93.5000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												3158.1868	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	584.8464	467.4454	386.9745	199.8133	68.3585	0.0000	0.0000	0.0000	0.0000	229.4572	421.2820	594.7272	(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)													
	625.5042	499.9416	413.8765	213.7041	73.1107	0.0000	0.0000	0.0000	0.0000	245.4088	450.5690	636.0719	(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													
	171.1852	150.4998	157.1547	139.6260	135.9216	120.1474	114.1487	126.9660	127.2775	144.8455	154.7344	166.6439	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.8333	87.6381	87.1259	85.7694	83.0873	79.8000	79.8000	79.8000	79.8000	86.0358	87.3536	87.9198	(217)
Fuel for water heating, kWh/month													
	194.8977	171.7288	180.3765	162.7924	163.5890	150.5606	143.0435	159.1053	159.4956	168.3549	177.1357	189.5408	(219)
Water heating fuel used												2020.6208	(219)
Annual totals kWh/year													
Space heating fuel - main system												3158.1868	(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)												315.1004	(232)
Total delivered energy for all uses												5568.9079	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3158.1868	0.2160	682.1683	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2020.6208	0.2160	436.4541	(264)
Space and water heating			1118.6224	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	315.1004	0.5190	163.5371	(268)
Total CO2, kg/m2/year			1321.0845	(272)
Emissions per m2 for space and water heating			15.7110	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.2969	(272b)
Emissions per m2 for pumps and fans			0.5467	(272c)
Target Carbon Dioxide Emission Rate (TER) = (15.7110 * 1.00) + 2.2969 + 0.5467, rounded to 2 d.p.			18.5500	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	A-3-02	**Issued on Date**	05/02/2020
Assessment Reference	ASHP - be lean	**Prop Type Ref**	2bed 3F
Property			

SAP Rating	83 B	**DER**	18.46	**TER**	18.55
Environmental	87 B	**% DER<TER**	0.51		
CO_2 Emissions (t/year)	1.07	**DFEE**	51.87	**TFEE**	55.41
General Requirements Compliance	Fail	**% DFEE<TFEE**	6.38		

Assessor Details	Miss Claudia Cioli, Claudia Cioli, Tel: 07481524839, clacioli@gmail.com	**Assessor ID**	R479-0001
Client			

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

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DWELLING AS DESIGNED

Mid-floor flat, total floor area 71 m²

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

1a TER and DER
Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 18.55 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 18.46 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)55.4 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)51.9 kWh/m²/yrOK

---
2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.18 (max. 0.20)	0.18 (max. 0.35)	OK
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction

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

---
4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage Measured cylinder loss: 0.74 kWh/day
Permitted by DBSCG 0.32 Fail
Primary pipework insulated: No primary pipework

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

Hot water controls: No cylinderstat

---
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: 94%
Minimum: 70% OK

---
9 Summertime temperature
Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing North East: 1.92 m², No overhang
Windows facing North West: 16.01 m², No overhang
Air change rate: 0.50 ach
Blinds/curtains: None

---
10 Key features
Party wall U-value 0.00 W/m²K
Air permeability 3.0 m³/m²h

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	71.2000 (1b)	x	2.4000 (2b)	=	170.8800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.2000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	170.8800	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							0 * 10 =	0.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.0000	
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	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) =	79.9000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2631	0.2599	0.2567	0.2408	0.2376	0.2216	0.2216	0.2184	0.2280	0.2376	0.2439	0.2503	(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	
W10 (Uw = 1.40)			1.9200	1.3258	2.5455			(27)
W03 (Uw = 1.40)			8.4000	1.3258	11.1364			(27)
W02 (Uw = 1.40)			7.6100	1.3258	10.0890			(27)
door			2.1000	1.4000	2.9400			(26a)
External Wall 1	53.7400	17.9300	35.8100	0.1500	5.3715	140.0000	5013.4000	(29a)
Corridor wall	7.8000	2.1000	5.7000	0.1409	0.8032	110.0000	627.0000	(29a)
Exposed ceiling	35.8000		35.8000	0.1800	6.4440	9.0000	322.2000	(30)
Total net area of external elements Aum(A, m2)			97.3400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		39.3295			(33)
Party Wall 1			39.3000	0.0000	0.0000	140.0000	5502.0000	(32)
Party Floor			71.2000			80.0000	5696.0000	(32d)
Party Ceilings			35.4000			80.0000	2832.0000	(32b)
Internal Wall			123.8000			9.0000	1114.2000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 21106.8000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	296.4438	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	15.4420	(36)
Total fabric heat loss	(33) + (36) = 54.7715	(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	14.8342	14.6545	14.4747	13.5760	13.3962	12.4975	12.4975	12.3178	12.8570	13.3962	13.7557	14.1152	(38)
Heat transfer coeff	69.6057	69.4260	69.2462	68.3475	68.1678	67.2690	67.2690	67.0893	67.6285	68.1678	68.5273	68.8867	(39)
Average = Sum(39)m / 12 =												68.3026	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9776	0.9751	0.9726	0.9599	0.9574	0.9448	0.9448	0.9423	0.9498	0.9574	0.9625	0.9675	(40)
HLP (average)												0.9593	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2749 (42)
Average daily hot water use (litres/day)	92.8725 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Daily hot water use													
	102.1598	98.4449	94.7300	91.0151	87.3002	83.5853	83.5853	87.3002	91.0151	94.7300	98.4449	102.1598	(44)
Energy conte	151.5000	132.5029	136.7311	119.2055	114.3805	98.7017	91.4616	104.9536	106.2070	123.7741	135.1091	146.7197	(45)
Energy content (annual)										Total = Sum(45)m =		1461.2468	(45)
Distribution loss (46)m = 0.15 x (45)m													
	22.7250	19.8754	20.5097	17.8808	17.1571	14.8053	13.7192	15.7430	15.9311	18.5661	20.2664	22.0080	(46)
Water storage loss:													
Store volume												2.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.7400	(48)
Temperature factor from Table 2b												1.0000	(49)
Enter (49) or (54) in (55)												0.7400	(55)
Total storage loss													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(56)
If cylinder contains dedicated solar storage													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(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													
	197.7024	174.2341	182.9335	163.9175	160.5829	143.4137	137.6640	151.1560	150.9190	169.9765	179.8211	192.9221	(62)
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													
	197.7024	174.2341	182.9335	163.9175	160.5829	143.4137	137.6640	151.1560	150.9190	169.9765	179.8211	192.9221	(64)
								Total per year (kWh/year) = Sum(64)m =				2005.2428	(64)
Heat gains from water heating, kWh/month													
	87.3357	77.4422	82.4250	75.4054	74.9934	68.5879	67.3729	71.8590	71.0834	78.1168	80.6934	85.7462	(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	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	17.8374	15.8430	12.8844	9.7543	7.2915	6.1558	6.6515	8.6459	11.6045	14.7346	17.1975	18.3332	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	200.0814	202.1576	196.9256	185.7873	171.7272	158.5126	149.6845	147.6083	152.8403	163.9786	178.0388	191.2533	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	(71)
Water heating gains (Table 5)													
	117.3867	115.2413	110.7863	104.7298	100.7976	95.2610	90.5550	96.5846	98.7270	104.9957	112.0741	115.2503	(72)
Total internal gains													
	392.4290	390.3655	377.7199	357.3949	336.9398	317.0529	304.0146	309.9624	320.2954	340.8325	364.4339	381.9603	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	1.9200	11.2829	0.3700	0.6500	0.7700	3.6105	(75)
Northwest	8.4000	11.2829	0.3700	0.8900	0.7700	21.6285	(81)
Northwest	7.6100	11.2829	0.5600	0.6800	0.7700	22.6588	(81)

Solar gains	47.8979	97.4975	175.6594	288.4833	387.7781	413.4125	386.7389	308.3128	214.0438	119.1496	60.2679	39.1158	(83)
Total gains	440.3269	487.8630	553.3793	645.8782	724.7180	730.4655	690.7535	618.2752	534.3391	459.9821	424.7018	421.0761	(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	84.2316	84.4497	84.6689	85.7822	86.0084	87.1575	87.1575	87.3910	86.6942	86.0084	85.5572	85.1107	
alpha	6.6154	6.6300	6.6446	6.7188	6.7339	6.8105	6.8105	6.8261	6.7796	6.7339	6.7038	6.6740	
util living area													
	0.9990	0.9977	0.9913	0.9511	0.8057	0.5827	0.4277	0.4970	0.8055	0.9802	0.9975	0.9993	(86)
MIT	20.1456	20.2535	20.4609	20.7478	20.9407	20.9942	20.9994	20.9984	20.9570	20.6938	20.3730	20.1276	(87)
Th 2	20.1020	20.1041	20.1063	20.1169	20.1190	20.1296	20.1296	20.1317	20.1253	20.1190	20.1147	20.1105	(88)
util rest of house													
	0.9986	0.9968	0.9878	0.9321	0.7509	0.5067	0.3436	0.4044	0.7298	0.9691	0.9964	0.9990	(89)
MIT 2	18.9586	19.1178	19.4206	19.8309	20.0674	20.1264	20.1294	20.1312	20.0948	19.7661	19.3009	18.9388	(90)
Living area fraction									fLA = Living area / (4) =			0.3581	(91)
MIT	19.3837	19.5245	19.7932	20.1593	20.3801	20.4372	20.4410	20.4418	20.4036	20.0983	19.6849	19.3646	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3837	19.5245	19.7932	20.1593	20.3801	20.4372	20.4410	20.4418	20.4036	20.0983	19.6849	19.3646	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9981	0.9960	0.9862	0.9332	0.7681	0.5339	0.3738	0.4377	0.7557	0.9688	0.9956	0.9986	(94)
Useful gains	439.5108	485.8899	545.7179	602.7303	556.6845	389.9908	258.1795	270.6102	403.7799	445.6392	422.8262	420.4912	(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													
	1049.9127	1015.3225	920.5031	769.5455	591.7047	392.6608	258.3792	271.1595	426.3039	647.4804	862.4095	1044.6388	(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													

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	454.1390	355.7787	278.8402	120.1070	26.0550	0.0000	0.0000	0.0000	0.0000	150.1699	316.5000	464.3658 (98)
Space heating												2165.9555 (98)
Space heating per m2											(98) / (4) =	30.4207 (99)

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1000 (306)
Space heating:	
Annual space heating requirement	2165.9555 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.10	2382.5510 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2005.2428 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.10	2205.7671 (310a)
Electricity used for heat distribution	45.8832 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.2500, SFP = 0.6625)	
mechanical ventilation fans (SFP = 0.6625)	138.1138 (330a)
Total electricity for the above, kWh/year	138.1138 (331)
Electricity for lighting (calculated in Appendix L)	315.0141 (332)
Total delivered energy for all uses	5041.4460 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Boilers			93.9000	(367a)
Space heating from Boilers	4886.3878	0.2160	1055.4598	(367)
Electrical energy for heat distribution	45.8832	0.5190	23.8134	(372)
Total CO2 associated with community systems			1079.2731	(373)
(negative value allowed since DFEE <= TFEE)				
Space and water heating			1079.2731	(376)
Pumps and fans	138.1138	0.5190	71.6810	(378)
Energy for lighting	315.0141	0.5190	163.4923	(379)
Total CO2, kg/year			1314.4465	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			18.4600	(384)

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

DER		18.4600	ZC1
Total Floor Area	TFA	71.2000	
Assumed number of occupants	N	2.2749	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.6523	ZC2
CO2 emissions from cooking, equation (L16)		2.4382	ZC3
Total CO2 emissions		37.5504	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		37.5504	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	71.2000 (1b)	x	2.4000 (2b)	=	170.8800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.2000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	170.8800	(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							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) =	0.1756	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.4256	(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) =	0.3617	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4612	0.4522	0.4431	0.3979	0.3889	0.3436	0.3436	0.3346	0.3617	0.3889	0.4069	0.4250	(22b)
Effective ac	0.6064	0.6022	0.5982	0.5792	0.5756	0.5590	0.5590	0.5560	0.5654	0.5756	0.5828	0.5903	(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 Semi-glazed door			2.1000	1.2000	2.5200			(26a)
TER Opening Type (Uw = 1.40)			15.7000	1.3258	20.8144			(27)
External Wall 1	53.7400	15.7000	38.0400	0.1800	6.8472			(29a)
Corridor wall	7.8000	2.1000	5.7000	0.1800	1.0260			(29a)
Exposed ceiling	35.8000		35.8000	0.1300	4.6540			(30)
Total net area of external elements Aum(A, m2)			97.3400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		35.8616			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.5745	(36)
Total fabric heat loss					(33) + (36) =		49.4361	(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	34.1925	33.9597	33.7314	32.6592	32.4586	31.5247	31.5247	31.3518	31.8845	32.4586	32.8644	33.2887	(38)
Heat transfer coeff	83.6286	83.3957	83.1675	82.0953	81.8947	80.9608	80.9608	80.7879	81.3205	81.8947	82.3005	82.7248	(39)
Average = Sum(39)m / 12 =												82.0943	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1746	1.1713	1.1681	1.1530	1.1502	1.1371	1.1371	1.1347	1.1421	1.1502	1.1559	1.1619	(40)
HLP (average)												1.1530	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.2749 (42)
Average daily hot water use (litres/day)		88.2289 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	97.0518	93.5227	89.9935	86.4643	82.9352	79.4060	79.4060	82.9352	86.4643	89.9935	93.5227	97.0518	(44)
Energy conte	143.9250	125.8778	129.8946	113.2452	108.6615	93.7666	86.8885	99.7059	100.8967	117.5854	128.3536	139.3837	(45)
Energy content (annual)										Total = Sum(45)m =		1388.1845	(45)
Distribution loss (46)m = 0.15 x (45)m	21.5888	18.8817	19.4842	16.9868	16.2992	14.0650	13.0333	14.9559	15.1345	17.6378	19.2530	20.9076	(46)
Water storage loss:													
Store volume												2.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.2388	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.1290	(55)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss
3.9977 3.6109 3.9977 3.8688 3.9977 3.8688 3.9977 3.9977 3.8688 3.9977 3.8688 3.9977 (56)
If cylinder contains dedicated solar storage
3.9977 3.6109 3.9977 3.8688 3.9977 3.8688 3.9977 3.9977 3.8688 3.9977 3.8688 3.9977 (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
171.1852 150.4998 157.1547 139.6260 135.9216 120.1474 114.1487 126.9660 127.2775 144.8455 154.7344 166.6439 (62)
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
171.1852 150.4998 157.1547 139.6260 135.9216 120.1474 114.1487 126.9660 127.2775 144.8455 154.7344 166.6439 (64)
Total per year (kWh/year) = Sum(64)m = 1709.1507 (64)
Heat gains from water heating, kWh/month
69.6632 61.5520 64.9981 58.7587 57.9381 52.2820 50.6986 54.9603 54.6528 60.9052 63.7822 68.1532 (65)

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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	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	17.8423	15.8474	12.8879	9.7570	7.2935	6.1575	6.6533	8.6483	11.6077	14.7386	17.2022	18.3382	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	200.0814	202.1576	196.9256	185.7873	171.7272	158.5126	149.6845	147.6083	152.8403	163.9786	178.0388	191.2533	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	(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)													
	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	(71)
Water heating gains (Table 5)													
	93.6333	91.5952	87.3630	81.6093	77.8737	72.6139	68.1432	73.8714	75.9066	81.8619	88.5864	91.6038	(72)
Total internal gains													
	371.6805	369.7238	357.3001	337.2771	317.0179	297.4076	284.6046	290.2515	300.4782	320.7027	343.9508	361.3188	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	1.6800	11.2829	0.6300	0.7000	0.7700	5.7930	(75)
Northwest	14.0200	11.2829	0.6300	0.7000	0.7700	48.3440	(81)

Solar gains	54.1370	110.1973	198.5405	326.0606	438.2894	467.2629	437.1149	348.4731	241.9248	134.6699	68.1183	44.2110	(83)
Total gains	425.8175	479.9211	555.8406	663.3377	755.3074	764.6705	721.7195	638.7246	542.4029	455.3726	412.0691	405.5297	(84)

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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	59.1238	59.2889	59.4517	60.2281	60.3756	61.0720	61.0720	61.2028	60.8019	60.3756	60.0779	59.7698	
alpha	4.9416	4.9526	4.9634	5.0152	5.0250	5.0715	5.0715	5.0802	5.0535	5.0250	5.0052	4.9847	
util living area													
	0.9980	0.9961	0.9883	0.9519	0.8375	0.6441	0.4865	0.5657	0.8486	0.9795	0.9961	0.9985	(86)
MIT	19.7241	19.8639	20.1368	20.5229	20.8298	20.9661	20.9933	20.9864	20.8668	20.4649	20.0335	19.7037	(87)
Th 2	19.9404	19.9430	19.9456	19.9578	19.9600	19.9707	19.9707	19.9726	19.9666	19.9600	19.9554	19.9506	(88)
util rest of house													
	0.9974	0.9947	0.9841	0.9342	0.7849	0.5542	0.3764	0.4475	0.7770	0.9690	0.9945	0.9980	(89)
MIT 2	18.2415	18.4474	18.8456	19.4015	19.7985	19.9492	19.9683	19.9672	19.8590	19.3317	18.7045	18.2190	(90)
Living area fraction									fLA = Living area / (4) =			0.3581	(91)
MIT	18.7725	18.9547	19.3081	19.8031	20.1679	20.3134	20.3354	20.3322	20.2199	19.7375	19.1805	18.7507	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7725	18.9547	19.3081	19.8031	20.1679	20.3134	20.3354	20.3322	20.2199	19.7375	19.1805	18.7507	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9963	0.9929	0.9807	0.9310	0.7965	0.5853	0.4161	0.4901	0.7969	0.9660	0.9928	0.9971	(94)
Useful gains	424.2329	476.5016	545.0880	617.5752	601.5932	447.5745	300.2753	313.0120	432.2517	439.9051	409.1169	404.3412	(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													
	1210.3168	1172.1049	1065.2150	895.0937	693.4728	462.5635	302.4191	317.6734	497.6762	748.3153	994.2308	1203.7058	(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													
	584.8464	467.4454	386.9745	199.8133	68.3585	0.0000	0.0000	0.0000	0.0000	229.4572	421.2820	594.7272	(98)
Space heating												2952.9046	(98)
Space heating per m2											(98) / (4) =	41.4734	(99)

8c. Space cooling requirement

Not applicable

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												93.5000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												3158.1868	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	584.8464	467.4454	386.9745	199.8133	68.3585	0.0000	0.0000	0.0000	0.0000	229.4572	421.2820	594.7272	(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)													
	625.5042	499.9416	413.8765	213.7041	73.1107	0.0000	0.0000	0.0000	0.0000	245.4088	450.5690	636.0719	(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													
	171.1852	150.4998	157.1547	139.6260	135.9216	120.1474	114.1487	126.9660	127.2775	144.8455	154.7344	166.6439	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.8333	87.6381	87.1259	85.7694	83.0873	79.8000	79.8000	79.8000	79.8000	86.0358	87.3536	87.9198	(217)
Fuel for water heating, kWh/month													
	194.8977	171.7288	180.3765	162.7924	163.5890	150.5606	143.0435	159.1053	159.4956	168.3549	177.1357	189.5408	(219)
Water heating fuel used												2020.6208	(219)
Annual totals kWh/year													
Space heating fuel - main system												3158.1868	(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)												315.1004	(232)
Total delivered energy for all uses												5568.9079	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3158.1868	0.2160	682.1683	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2020.6208	0.2160	436.4541	(264)
Space and water heating			1118.6224	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	315.1004	0.5190	163.5371	(268)
Total CO2, kg/m2/year			1321.0845	(272)
Emissions per m2 for space and water heating			15.7110	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.2969	(272b)
Emissions per m2 for pumps and fans			0.5467	(272c)
Target Carbon Dioxide Emission Rate (TER) = (15.7110 * 1.00) + 2.2969 + 0.5467, rounded to 2 d.p.			18.5500	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	A-3-03	**Issued on Date**	05/02/2020
Assessment Reference	ASHP - be lean	**Prop Type Ref**	2bed 3F
Property			

SAP Rating	77 C	**DER**	28.24	**TER**	27.50
Environmental	81 B	**% DER<TER**	-2.69		
CO_2 Emissions (t/year)	1.34	**DFEE**	87.10	**TFEE**	97.13
General Requirements Compliance	Fail	**% DFEE<TFEE**	10.32		

Assessor Details	Miss Claudia Cioli, Claudia Cioli, Tel: 07481524839, clacioli@gmail.com	**Assessor ID**	R479-0001
Client			

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

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DWELLING AS DESIGNED

Mid-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 (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 27.50 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 28.24 kgCO□/m²Fail
Excess emissions =0.74 kgCO□/m² (2.7%)

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)97.1 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)87.1 kWh/m²/yrOK
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2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.18 (max. 0.20)	0.18 (max. 0.35)	OK
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction
---
3 Air permeability
Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK
---
4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None
---
5 Cylinder insulation
Hot water storage Measured cylinder loss: 0.74 kWh/day
Permitted by DBSCG 0.32 Fail
Primary pipework insulated: No primary pipework
---
6 Controls
Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinderstat

---
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: 94%
Minimum: 70% OK
---
9 Summertime temperature
Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing West: 12.20 m², No overhang
Air change rate: 0.50 ach
Blinds/curtains: None
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10 Key features
Party wall U-value 0.00 W/m²K
Thermal bridging y-value 0.033 W/m²K
Air permeability 3.0 m³/m²h

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	58.3000 (1b)	x	2.4000 (2b)	=	139.9200	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	58.3000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	139.9200	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							0 * 10 =	0.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.0000	
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1163	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation:	0.5000	(23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	79.9000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2487	0.2458	0.2429	0.2284	0.2255	0.2109	0.2109	0.2080	0.2168	0.2255	0.2313	0.2371	(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	
W03 (Uw = 1.40)			8.4000	1.3258	11.1364			(27)
W02 (Uw = 1.40)			3.8000	1.3258	5.0379			(27)
entrance door			2.1000	1.4000	2.9400			(26a)
External Wall 1	41.0000	12.2000	28.8000	0.1500	4.3200	140.0000	4032.0000	(29a)
Corridor Wall	277.0000	2.1000	274.9000	0.1500	41.2350	110.0000	30239.0000	(29a)
Exposed ceiling	6.7000		6.7000	0.1800	1.2060	9.0000	60.3000	(30)
Total net area of external elements Aum(A, m2)			324.7000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	65.8752			(33)
Party Wall 1			27.7000	0.0000	0.0000	140.0000	3878.0000	(32)
Party Floor			58.3000			80.0000	4664.0000	(32d)
Party Ceilings			51.6000			80.0000	4128.0000	(32b)
Internal Wall			74.0000			9.0000	666.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 47667.3000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	817.6209	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	10.5848	(36)
Total fabric heat loss	(33) + (36) = 76.4600	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	11.4842	11.3500	11.2159	10.5449	10.4107	9.7397	9.7397	9.6056	10.0081	10.4107	10.6791	10.9475	(38)
Heat transfer coeff	87.9443	87.8101	87.6759	87.0049	86.8707	86.1998	86.1998	86.0656	86.4682	86.8707	87.1391	87.4075	(39)
Average = Sum(39)m / 12 =												86.9714	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.5085	1.5062	1.5039	1.4924	1.4901	1.4786	1.4786	1.4763	1.4832	1.4901	1.4947	1.4993	(40)
HLP (average)												1.4918	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.9332 (42)
Average daily hot water use (litres/day)	84.3296 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	92.7625	89.3893	86.0162	82.6430	79.2698	75.8966	75.8966	79.2698	82.6430	86.0162	89.3893	92.7625	(44)
Energy conte	137.5642	120.3145	124.1538	108.2403	103.8591	89.6225	83.0484	95.2993	96.4375	112.3886	122.6809	133.2235	(45)
Energy content (annual)										Total = Sum(45)m =		1326.8325	(45)
Distribution loss (46)m = 0.15 x (45)m													
	20.6346	18.0472	18.6231	16.2360	15.5789	13.4434	12.4573	14.2949	14.4656	16.8583	18.4021	19.9835	(46)
Water storage loss:													
Store volume												2.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.7400	(48)
Temperature factor from Table 2b												1.0000	(49)
Enter (49) or (54) in (55)												0.7400	(55)
Total storage loss													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(56)
If cylinder contains dedicated solar storage													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(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													
	183.7666	162.0457	170.3562	152.9523	150.0615	134.3345	129.2508	141.5017	141.1495	158.5910	167.3929	179.4259	(62)
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													
	183.7666	162.0457	170.3562	152.9523	150.0615	134.3345	129.2508	141.5017	141.1495	158.5910	167.3929	179.4259	(64)
									Total per year (kWh/year) = Sum(64)m =			1870.8285	(64)
Heat gains from water heating, kWh/month													
	82.7020	73.3895	78.2430	71.7595	71.4951	65.5691	64.5755	68.6489	67.8351	74.3311	76.5610	81.2587	(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	96.6591	96.6591	96.6591	96.6591	96.6591	96.6591	96.6591	96.6591	96.6591	96.6591	96.6591	96.6591	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	15.0344	13.3534	10.8597	8.2215	6.1457	5.1884	5.6063	7.2873	9.7810	12.4192	14.4950	15.4522	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	168.6400	170.3900	165.9802	156.5922	144.7415	133.6035	126.1627	124.4127	128.8225	138.2105	150.0612	161.1992	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	32.6659	32.6659	32.6659	32.6659	32.6659	32.6659	32.6659	32.6659	32.6659	32.6659	32.6659	32.6659	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-77.3273	-77.3273	-77.3273	-77.3273	-77.3273	-77.3273	-77.3273	-77.3273	-77.3273	-77.3273	-77.3273	-77.3273	(71)
Water heating gains (Table 5)													
	111.1586	109.2106	105.1654	99.6660	96.0955	91.0682	86.7951	92.2701	94.2154	99.9074	106.3347	109.2187	(72)
Total internal gains													
	346.8308	344.9517	334.0030	316.4774	298.9804	281.8579	270.5618	275.9678	284.8166	302.5349	322.8887	337.8679	(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	8.4000	19.6403	0.3700	0.8900	0.7700	37.6488	(80)
West	3.8000	19.6403	0.3700	0.6800	0.7700	13.0129	(80)

Solar gains	50.6618	99.1051	163.2121	238.0351	291.7209	298.6282	284.3063	244.2149	189.8224	117.5966	63.1693	41.6618	(83)
Total gains	397.4925	444.0569	497.2151	554.5124	590.7013	580.4861	554.8680	520.1827	474.6390	420.1315	386.0580	379.5297	(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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	150.5603	150.7904	151.0212	152.1858	152.4209	153.6073	153.6073	153.8468	153.1305	152.4209	151.9514	151.4849	
alpha	11.0374	11.0527	11.0681	11.1457	11.1614	11.2405	11.2405	11.2565	11.2087	11.1614	11.1301	11.0990	
util living area													
	1.0000	1.0000	1.0000	0.9996	0.9917	0.8930	0.6805	0.7524	0.9832	0.9999	1.0000	1.0000	(86)
MIT	20.3967	20.4538	20.5639	20.7190	20.8747	20.9812	20.9991	20.9974	20.9267	20.7274	20.5348	20.3863	(87)
Th 2	19.6811	19.6829	19.6846	19.6932	19.6950	19.7036	19.7036	19.7054	19.7002	19.6950	19.6915	19.6880	(88)
util rest of house													
	1.0000	1.0000	0.9999	0.9988	0.9715	0.7495	0.4821	0.5466	0.9270	0.9996	1.0000	1.0000	(89)
MIT 2	18.8932	18.9783	19.1410	19.3752	19.5953	19.6996	19.7036	19.7052	19.6636	19.3893	19.1043	18.8839	(90)
Living area fraction									fLA = Living area / (4) =			0.4837	(91)
MIT	19.6204	19.6920	19.8293	20.0252	20.2142	20.3195	20.3302	20.3303	20.2746	20.0366	19.7963	19.6106	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6204	19.6920	19.8293	20.0252	20.2142	20.3195	20.3302	20.3303	20.2746	20.0366	19.7963	19.6106	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	1.0000	1.0000	1.0000	0.9991	0.9825	0.8257	0.5790	0.6485	0.9611	0.9997	1.0000	1.0000	(94)
Useful gains	397.4921	444.0548	497.1928	554.0356	580.3593	479.3155	321.2495	337.3259	456.1525	420.0136	386.0559	379.5295	(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													
	1347.3458	1298.8850	1168.6547	967.9444	739.6329	493.0203	321.5434	338.2620	533.9024	819.7606	1106.3429	1347.0062	(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													
	706.6911	574.4459	499.5677	298.0144	118.4995	0.0000	0.0000	0.0000	0.0000	297.4117	518.6066	719.8027	(98)
Space heating												3733.0396	(98)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Space heating per m2		(98) / (4) =	64.0316 (99)

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1000 (306)
Space heating:	
Annual space heating requirement	3733.0396 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.10	4106.3436 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1870.8285 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.10	2057.9114 (310a)
Electricity used for heat distribution	61.6425 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.2500, SFP = 0.6625)	
mechanical ventilation fans (SFP = 0.6625)	113.0903 (330a)
Total electricity for the above, kWh/year	113.0903 (331)
Electricity for lighting (calculated in Appendix L)	265.5119 (332)
Total delivered energy for all uses	6542.8572 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Boilers			93.9000	(367a)
Space heating from Boilers	6564.7018	0.2160	1417.9756	(367)
Electrical energy for heat distribution	61.6425	0.5190	31.9925	(372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			1449.9681	(373)
Space and water heating			1449.9681	(376)
Pumps and fans	113.0903	0.5190	58.6939	(378)
Energy for lighting	265.5119	0.5190	137.8007	(379)
Total CO2, kg/year			1646.4626	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			28.2400	(384)

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

DER		28.2400	ZC1
Total Floor Area	TFA	58.3000	
Assumed number of occupants	N	1.9332	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.1411	ZC2
CO2 emissions from cooking, equation (L16)		2.8370	ZC3
Total CO2 emissions		48.2181	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		48.2181	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	58.3000 (1b)	x	2.4000 (2b)	=	139.9200	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	58.3000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	139.9200	(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)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1429	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3929	(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) =	0.3045	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3883	0.3807	0.3730	0.3350	0.3274	0.2893	0.2893	0.2817	0.3045	0.3274	0.3426	0.3578	(22b)
Effective ac	0.5754	0.5725	0.5696	0.5561	0.5536	0.5418	0.5418	0.5397	0.5464	0.5536	0.5587	0.5640	(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 Semi-glazed door			2.1000	1.2000	2.5200			(26a)
TER Opening Type (Uw = 1.40)			12.2000	1.3258	16.1742			(27)
External Wall 1	41.0000	12.2000	28.8000	0.1800	5.1840			(29a)
Corridor Wall	277.0000	2.1000	274.9000	0.1800	49.4820			(29a)
Exposed ceiling	6.7000		6.7000	0.1300	0.8710			(30)
Total net area of external elements Aum(A, m2)			324.7000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		74.2312			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	9.3348	(36)
Total fabric heat loss (33) + (36) =	83.5660	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.5673	26.4321	26.2996	25.6774	25.5610	25.0191	25.0191	24.9187	25.2278	25.5610	25.7965	26.0427	(38)
Heat transfer coeff	110.1333	109.9982	109.8657	109.2435	109.1270	108.5851	108.5851	108.4847	108.7938	109.1270	109.3625	109.6088	(39)
Average = Sum(39)m / 12 =												109.2429	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.8891	1.8868	1.8845	1.8738	1.8718	1.8625	1.8625	1.8608	1.8661	1.8718	1.8759	1.8801	(40)
HLP (average)												1.8738	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.9332 (42)
Average daily hot water use (litres/day)	80.1131 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	88.1244	84.9199	81.7154	78.5108	75.3063	72.1018	72.1018	75.3063	78.5108	81.7154	84.9199	88.1244	(44)
Energy conte	130.6859	114.2988	117.9461	102.8283	98.6662	85.1414	78.8960	90.5343	91.6156	106.7691	116.5469	126.5624	(45)
Energy content (annual)										Total = Sum(45)m =		1260.4909	(45)
Distribution loss (46)m = 0.15 x (45)m	19.6029	17.1448	17.6919	15.4242	14.7999	12.7712	11.8344	13.5801	13.7423	16.0154	17.4820	18.9844	(46)

Water storage loss:	
Store volume	2.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	0.2388 (48)
Temperature factor from Table 2b	0.5400 (49)
Enter (49) or (54) in (55)	0.1290 (55)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss
3.9977 3.6109 3.9977 3.8688 3.9977 3.8688 3.9977 3.9977 3.8688 3.9977 3.8688 3.9977 (56)
If cylinder contains dedicated solar storage
3.9977 3.6109 3.9977 3.8688 3.9977 3.8688 3.9977 3.9977 3.8688 3.9977 3.8688 3.9977 (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
157.9461 138.9208 145.2062 129.2090 125.9263 111.5222 106.1562 117.7945 117.9964 134.0293 142.9277 153.8225 (62)
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
157.9461 138.9208 145.2062 129.2090 125.9263 111.5222 106.1562 117.7945 117.9964 134.0293 142.9277 153.8225 (64)
Total per year (kWh/year) = Sum(64)m = 1581.4571 (64)
Heat gains from water heating, kWh/month
65.2612 57.7020 61.0252 55.2950 54.6146 49.4141 48.0410 51.9108 51.5668 57.3089 59.8565 63.8901 (65)

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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	96.6591	96.6591	96.6591	96.6591	96.6591	96.6591	96.6591	96.6591	96.6591	96.6591	96.6591	96.6591	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
15.0794 13.3934 10.8922 8.2461 6.1641 5.2040 5.6231 7.3091 9.8102 12.4564 14.5384 15.4985 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
168.6400 170.3900 165.9802 156.5922 144.7415 133.6035 126.1627 124.4127 128.8225 138.2105 150.0612 161.1992 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
32.6659 32.6659 32.6659 32.6659 32.6659 32.6659 32.6659 32.6659 32.6659 32.6659 32.6659 32.6659 (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)
-77.3273 -77.3273 -77.3273 -77.3273 -77.3273 -77.3273 -77.3273 -77.3273 -77.3273 -77.3273 -77.3273 -77.3273 (71)
Water heating gains (Table 5)
87.7167 85.8661 82.0231 76.7986 73.4067 68.6308 64.5713 69.7726 71.6206 77.0280 83.1340 85.8738 (72)
Total internal gains
326.4338 324.6472 313.8933 296.6347 279.3100 262.4360 251.3548 256.4921 265.2511 282.6927 302.7314 317.5692 (73)

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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	12.2000	19.6403	0.6300	0.7000	0.7700	73.2283	(80)

Solar gains 73.2283 143.2501 235.9125 344.0643 421.6637 431.6479 410.9464 352.9969 274.3760 169.9783 91.3071 60.2194 (83)
Total gains 399.6622 467.8973 549.8058 640.6990 700.9738 694.0838 662.3011 609.4890 539.6271 452.6710 394.0384 377.7886 (84)

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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	36.7610	36.8062	36.8506	37.0604	37.1000	37.2851	37.2851	37.3196	37.2136	37.1000	37.0201	36.9369	
alpha	3.4507	3.4537	3.4567	3.4707	3.4733	3.4857	3.4857	3.4880	3.4809	3.4733	3.4680	3.4625	

util living area
0.9960 0.9926 0.9833 0.9566 0.8943 0.7775 0.6376 0.6941 0.8846 0.9749 0.9931 0.9967 (86)

MIT	18.9538	19.1443	19.5047	19.9909	20.4476	20.7786	20.9209	20.8916	20.6105	20.0125	19.3939	18.9172	(87)
Th 2	19.4083	19.4099	19.4115	19.4188	19.4202	19.4266	19.4266	19.4277	19.4241	19.4202	19.4174	19.4145	(88)

util rest of house
0.9945 0.9898 0.9765 0.9371 0.8418 0.6581 0.4458 0.5082 0.8035 0.9601 0.9900 0.9955 (89)

MIT 2	16.7747	17.0530	17.5768	18.2750	18.8939	19.2860	19.4022	19.3887	19.1201	18.3193	17.4232	16.7248	(90)

Living area fraction fLA = Living area / (4) = 0.4837 (91)

MIT	17.8287	18.0646	18.5093	19.1050	19.6454	20.0080	20.1368	20.1156	19.8410	19.1383	18.3764	17.7853	(92)

Temperature adjustment 0.0000
adjusted MIT 17.8287 18.0646 18.5093 19.1050 19.6454 20.0080 20.1368 20.1156 19.8410 19.1383 18.3764 17.7853 (93)

---
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9922	0.9862	0.9711	0.9321	0.8509	0.7082	0.5399	0.5986	0.8299	0.9564	0.9869	0.9935	(94)
Useful gains	396.5341	461.4562	533.9265	597.1897	596.4385	491.5489	357.6087	364.8372	447.8242	432.9254	388.8789	375.3416	(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
1489.9660 1448.0808 1319.4110 1114.8299 867.0583 587.2276 384.0469 403.0911 624.5879 931.7603 1233.2190 1489.0642 (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
813.5133 663.0117 584.4004 372.7009 201.3411 0.0000 0.0000 0.0000 0.0000 371.1332 607.9249 828.6096 (98)
Space heating 4442.6351 (98)
Space heating per m2 (98) / (4) = 76.2030 (99)

8c. Space cooling requirement

Not applicable

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												4751.4814	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	813.5133	663.0117	584.4004	372.7009	201.3411	0.0000	0.0000	0.0000	0.0000	371.1332	607.9249	828.6096	(98)
Space heating efficiency (main heating system 1)													
	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)													
	870.0677	709.1034	625.0272	398.6106	215.3381	0.0000	0.0000	0.0000	0.0000	396.9339	650.1870	886.2135	(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													
	157.9461	138.9208	145.2062	129.2090	125.9263	111.5222	106.1562	117.7945	117.9964	134.0293	142.9277	153.8225	(64)
Efficiency of water heater												79.8000	(216)
(217)m	88.5692	88.4456	88.1477	87.4803	86.0599	79.8000	79.8000	79.8000	79.8000	87.3910	88.2476	88.6391	(217)
Fuel for water heating, kWh/month													
	178.3308	157.0692	164.7305	147.7007	146.3241	139.7521	133.0278	147.6121	147.8651	153.3673	161.9621	173.5380	(219)
Water heating fuel used												1851.2799	(219)
Annual totals kWh/year													
Space heating fuel - main system												4751.4814	(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)												266.3071	(232)
Total delivered energy for all uses												6944.0683	(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	4751.4814	0.2160	1026.3200	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1851.2799	0.2160	399.8765	(264)
Space and water heating			1426.1964	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	266.3071	0.5190	138.2134	(268)
Total CO2, kg/m2/year			1603.3348	(272)
Emissions per m2 for space and water heating			24.4631	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.3707	(272b)
Emissions per m2 for pumps and fans			0.6677	(272c)
Target Carbon Dioxide Emission Rate (TER) = (24.4631 * 1.00) + 2.3707 + 0.6677, rounded to 2 d.p.			27.5000	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	A-3-05	**Issued on Date**	05/02/2020
Assessment Reference	ASHP - be lean	**Prop Type Ref**	2bed 3F
Property			

SAP Rating	83 B	**DER**	17.25	**TER**	17.36
Environmental	88 B	**% DER<TER**	0.62		
CO_2 Emissions (t/year)	0.97	**DFEE**	45.21	**TFEE**	48.34
General Requirements Compliance	Fail	**% DFEE<TFEE**	6.46		

Assessor Details	Miss Claudia Cioli, Claudia Cioli, Tel: 07481524839, clacioli@gmail.com	**Assessor ID**	R479-0001
Client			

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

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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England
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DWELLING AS DESIGNED

Mid-floor flat, total floor area 68 m²

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

1a TER and DER
Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 17.36 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 17.25 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)48.3 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)45.2 kWh/m²/yrOK

---
2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.18 (max. 0.20)	0.18 (max. 0.35)	OK
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction

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

---
4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage Measured cylinder loss: 0.74 kWh/day
Permitted by DBSCG 0.32 Fail
Primary pipework insulated: No primary pipework

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

Hot water controls: No cylinderstat

---
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: 94%
Minimum: 70% OK

---
9 Summertime temperature
Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing South East: 7.61 m², No overhang
Windows facing South: 3.80 m², No overhang
Windows facing West: 8.40 m², No overhang
Air change rate: 0.50 ach
Blinds/curtains: None

---
10 Key features
Party wall U-value 0.00 W/m²K
Air permeability 3.0 m³/m²h

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	68.1000 (1b)	x	2.4000 (2b)	=	163.4400	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.1000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	163.4400	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							0 * 10 =	0.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.0000	
Infiltration rate		0.1500	(18)
Number of sides sheltered		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

If mechanical ventilation:	0.5000	(23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	79.9000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2774	0.2739	0.2705	0.2531	0.2497	0.2323	0.2323	0.2288	0.2393	0.2497	0.2566	0.2635	(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	
W03 (Uw = 1.40)			8.4000	1.3258	11.1364			(27)
W02 (Uw = 1.40)			11.4100	1.3258	15.1269			(27)
door			2.1000	1.4000	2.9400			(26a)
External Wall 1	62.2000	19.8100	42.3900	0.1500	6.3585	140.0000	5934.6000	(29a)
Corridor wall	4.1500	2.1000	2.0500	0.1409	0.2889	110.0000	225.5000	(29a)
Exposed ceiling	9.6000		9.6000	0.1800	1.7280	9.0000	86.4000	(30)
Total net area of external elements Aum(A, m2)			75.9500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	37.5786			(33)
Party Wall 1			31.9000	0.0000	0.0000	140.0000	4466.0000	(32)
Party Floor			68.1000			80.0000	5448.0000	(32d)
Party Ceilings			58.5000			80.0000	4680.0000	(32b)
Internal Wall			109.6000			9.0000	986.4000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 21826.9000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	320.5125	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	18.3210	(36)
Total fabric heat loss	(33) + (36) = 55.8996	(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	14.9620	14.7749	14.5878	13.6523	13.4653	12.5298	12.5298	12.3427	12.9040	13.4653	13.8394	14.2136	(38)
Heat transfer coeff	70.8616	70.6745	70.4874	69.5520	69.3649	68.4294	68.4294	68.2424	68.8036	69.3649	69.7391	70.1132	(39)
Average = Sum(39)m / 12 =												69.5052	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0406	1.0378	1.0351	1.0213	1.0186	1.0048	1.0048	1.0021	1.0103	1.0186	1.0241	1.0296	(40)
HLP (average)												1.0206	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.1991 (42)
Average daily hot water use (litres/day)	90.9782 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	100.0760	96.4369	92.7978	89.1586	85.5195	81.8804	81.8804	85.5195	89.1586	92.7978	96.4369	100.0760	(44)
Energy conte	148.4098	129.8002	133.9422	116.7740	112.0475	96.6884	89.5960	102.8128	104.0407	121.2494	132.3532	143.7270	(45)
Energy content (annual)										Total = Sum(45)m =		1431.4411	(45)
Distribution loss (46)m = 0.15 x (45)m													
	22.2615	19.4700	20.0913	17.5161	16.8071	14.5033	13.4394	15.4219	15.6061	18.1874	19.8530	21.5590	(46)
Water storage loss:													
Store volume												2.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.7400	(48)
Temperature factor from Table 2b												1.0000	(49)
Enter (49) or (54) in (55)												0.7400	(55)
Total storage loss													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(56)
If cylinder contains dedicated solar storage													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(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													
	194.6122	171.5314	180.1446	161.4860	158.2499	141.4004	135.7984	149.0152	148.7527	167.4518	177.0652	189.9294	(62)
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													
	194.6122	171.5314	180.1446	161.4860	158.2499	141.4004	135.7984	149.0152	148.7527	167.4518	177.0652	189.9294	(64)
									Total per year (kWh/year) = Sum(64)m =			1975.4371	(64)
Heat gains from water heating, kWh/month													
	86.3082	76.5435	81.4977	74.5970	74.2177	67.9185	66.7526	71.1472	70.3631	77.2773	79.7770	84.7511	(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	109.9564	109.9564	109.9564	109.9564	109.9564	109.9564	109.9564	109.9564	109.9564	109.9564	109.9564	109.9564	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	17.1903	15.2682	12.4170	9.4004	7.0269	5.9324	6.4102	8.3322	11.1835	14.2000	16.5735	17.6680	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	192.8226	194.8235	189.7813	179.0470	165.4970	152.7619	144.2540	142.2532	147.2953	158.0296	171.5796	184.3147	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.9956	33.9956	33.9956	33.9956	33.9956	33.9956	33.9956	33.9956	33.9956	33.9956	33.9956	33.9956	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	(71)
Water heating gains (Table 5)													
	116.0056	113.9040	109.5399	103.6069	99.7550	94.3313	89.7212	95.6279	97.7266	103.8674	110.8014	113.9128	(72)
Total internal gains													
	382.0054	379.9827	367.7251	348.0413	328.2658	309.0125	296.3724	302.2002	312.1923	332.0839	354.9415	371.8825	(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	8.4000	19.6403	0.3700	0.8900	0.7700	37.6488	(80)
Southeast	7.6100	36.7938	0.5600	0.6800	0.7700	73.8907	(77)
South	3.8000	46.7521	0.5600	0.6800	0.7700	46.8829	(78)

Solar gains	158.4225	276.2945	391.3080	500.8150	570.9840	570.0534	548.3507	496.3150	429.7043	309.3133	191.0200	134.7068	(83)
Total gains	540.4278	656.2771	759.0330	848.8563	899.2499	879.0659	844.7231	798.5152	741.8966	641.3972	545.9614	506.5893	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	85.5616	85.7881	86.0158	87.1726	87.4077	88.6026	88.6026	88.8455	88.1208	87.4077	86.9388	86.4748	
alpha	6.7041	6.7192	6.7344	6.8115	6.8272	6.9068	6.9068	6.9230	6.8747	6.8272	6.7959	6.7650	
util living area													
	0.9972	0.9894	0.9614	0.8682	0.6947	0.4962	0.3563	0.3928	0.6289	0.9174	0.9911	0.9981	(86)
MIT	20.2612	20.4397	20.6646	20.8797	20.9765	20.9979	20.9998	20.9997	20.9906	20.8470	20.5078	20.2281	(87)
Th 2	20.0497	20.0519	20.0542	20.0656	20.0679	20.0793	20.0793	20.0816	20.0747	20.0679	20.0633	20.0588	(88)
util rest of house													
	0.9960	0.9852	0.9475	0.8301	0.6336	0.4258	0.2818	0.3146	0.5498	0.8823	0.9869	0.9973	(89)
MIT 2	19.0796	19.3393	19.6573	19.9444	20.0498	20.0783	20.0793	20.0815	20.0693	19.9149	19.4485	19.0385	(90)
Living area fraction									fLA = Living area / (4) =			0.4581	(91)
MIT	19.6209	19.8435	20.1188	20.3729	20.4744	20.4996	20.5010	20.5022	20.4914	20.3419	19.9338	19.5835	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6209	19.8435	20.1188	20.3729	20.4744	20.4996	20.5010	20.5022	20.4914	20.3419	19.9338	19.5835	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9953	0.9841	0.9486	0.8435	0.6608	0.4581	0.3159	0.3504	0.5860	0.8938	0.9861	0.9968	(94)
Useful gains	537.8893	645.8521	720.0142	715.9934	594.2683	402.6947	266.8802	279.8121	434.7547	573.2870	538.3992	504.9669	(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													
	1085.6659	1056.1215	959.9541	797.9637	608.6360	403.7081	266.9442	279.9404	439.7517	675.7485	895.0202	1078.5859	(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													
	407.5457	275.7010	178.5153	59.0186	10.6896	0.0000	0.0000	0.0000	0.0000	76.2314	256.7671	426.7725	(98)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Space heating		1691.2413 (98)
Space heating per m2	(98) / (4) =	24.8347 (99)

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1000 (306)
Space heating:	
Annual space heating requirement	1691.2413 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.10	1860.3655 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1975.4371 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.10	2172.9808 (310a)
Electricity used for heat distribution	40.3335 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.2500, SFP = 0.6625)	
mechanical ventilation fans (SFP = 0.6625)	132.1004 (330a)
Total electricity for the above, kWh/year	132.1004 (331)
Electricity for lighting (calculated in Appendix L)	303.5856 (332)
Total delivered energy for all uses	4469.0323 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Boilers			93.9000	(367a)
Space heating from Boilers	4295.3635	0.2160	927.7985	(367)
Electrical energy for heat distribution	40.3335	0.5190	20.9331	(372)
Total CO2 associated with community systems			948.7316	(373)
(negative value allowed since DFEE <= TFEE)				
Space and water heating			948.7316	(376)
Pumps and fans	132.1004	0.5190	68.5601	(378)
Energy for lighting	303.5856	0.5190	157.5609	(379)
Total CO2, kg/year			1174.8526	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			17.2500	(384)

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

DER		17.2500	ZC1
Total Floor Area	TFA	68.1000	
Assumed number of occupants	N	2.1991	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.7786	ZC2
CO2 emissions from cooking, equation (L16)		2.5225	ZC3
Total CO2 emissions		36.5511	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		36.5511	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	68.1000 (1b)	x	2.4000 (2b)	=	163.4400	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.1000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	163.4400	(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)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1224	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3724	(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) =	0.3444	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4392	0.4306	0.4219	0.3789	0.3703	0.3272	0.3272	0.3186	0.3444	0.3703	0.3875	0.4047	(22b)
Effective ac	0.5964	0.5927	0.5890	0.5718	0.5686	0.5535	0.5535	0.5508	0.5593	0.5686	0.5751	0.5819	(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 Semi-glazed door			2.1000	1.2000	2.5200			(26a)
TER Opening Type (Uw = 1.40)			14.9200	1.3258	19.7803			(27)
External Wall 1	62.2000	14.9200	47.2800	0.1800	8.5104			(29a)
Corridor wall	4.1500	2.1000	2.0500	0.1800	0.3690			(29a)
Exposed ceiling	9.6000		9.6000	0.1300	1.2480			(30)
Total net area of external elements Aum(A, m2)			75.9500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.4277			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							16.0085	(36)
Total fabric heat loss					(33) + (36) =		48.4362	(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	32.1687	31.9667	31.7687	30.8389	30.6649	29.8551	29.8551	29.7051	30.1670	30.6649	31.0169	31.3848	(38)
Heat transfer coeff	80.6049	80.4029	80.2050	79.2751	79.1011	78.2913	78.2913	78.1413	78.6032	79.1011	79.4531	79.8210	(39)
Average = Sum(39)m / 12 =												79.2743	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1836	1.1807	1.1778	1.1641	1.1615	1.1497	1.1497	1.1474	1.1542	1.1615	1.1667	1.1721	(40)
HLP (average)												1.1641	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1991	(42)
Average daily hot water use (litres/day)												86.4293	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.0722	91.6150	88.1579	84.7007	81.2435	77.7863	77.7863	81.2435	84.7007	88.1579	91.6150	95.0722	(44)
Energy conte	140.9893	123.3102	127.2451	110.9353	106.4451	91.8540	85.1162	97.6721	98.8386	115.1869	125.7355	136.5406	(45)
Energy content (annual)										Total = Sum(45)m =		1359.8691	(45)
Distribution loss (46)m = 0.15 x (45)m	21.1484	18.4965	19.0868	16.6403	15.9668	13.7781	12.7674	14.6508	14.8258	17.2780	18.8603	20.4811	(46)
Water storage loss:													
Store volume												2.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.2388	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.1290	(55)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss
3.9977 3.6109 3.9977 3.8688 3.9977 3.8688 3.9977 3.9977 3.8688 3.9977 3.8688 3.9977 (56)
If cylinder contains dedicated solar storage
3.9977 3.6109 3.9977 3.8688 3.9977 3.8688 3.9977 3.9977 3.8688 3.9977 3.8688 3.9977 (57)
Primary loss 23.2624 21.0112 23.2624 22.5120 23.2624 22.5120 23.2624 23.2624 22.5120 23.2624 22.5120 23.2624 (59)
Total heat required for water heating calculated for each month
168.2495 147.9322 154.5052 137.3161 133.7052 118.2348 112.3764 124.9323 125.2194 142.4471 152.1163 163.8008 (62)
Solar input 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)
Output from w/h
168.2495 147.9322 154.5052 137.3161 133.7052 118.2348 112.3764 124.9323 125.2194 142.4471 152.1163 163.8008 (64)
Total per year (kWh/year) = Sum(64)m = 1680.8353 (64)
Heat gains from water heating, kWh/month
68.6871 60.6983 64.1171 57.9906 57.2011 51.6461 50.1093 54.2841 53.9685 60.1078 62.9117 67.2079 (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	109.9564	109.9564	109.9564	109.9564	109.9564	109.9564	109.9564	109.9564	109.9564	109.9564	109.9564	109.9564	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	17.1986	15.2756	12.4230	9.4050	7.0303	5.9353	6.4133	8.3363	11.1889	14.2069	16.5816	17.6766	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	192.8226	194.8235	189.7813	179.0470	165.4970	152.7619	144.2540	142.2532	147.2953	158.0296	171.5796	184.3147	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.9956	33.9956	33.9956	33.9956	33.9956	33.9956	33.9956	33.9956	33.9956	33.9956	33.9956	33.9956	(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)													
	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	(71)
Water heating gains (Table 5)													
	92.3213	90.3248	86.1789	80.5425	76.8832	71.7307	67.3512	72.9625	74.9562	80.7900	87.3773	90.3332	(72)
Total internal gains													
	361.3294	359.4108	347.3701	327.9815	308.3975	289.4148	277.0054	282.5388	292.4274	312.0134	334.5254	351.3114	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	5.7300	36.7938	0.6300	0.7000	0.7700	64.4320	(77)
South	2.8600	46.7521	0.6300	0.7000	0.7700	40.8638	(78)
West	6.3300	19.6403	0.6300	0.7000	0.7700	37.9947	(80)

Solar gains	143.2905	251.0015	357.8203	460.9333	527.5918	527.4862	507.1024	457.6414	394.0130	281.6767	172.9871	121.6954	(83)
Total gains	504.6199	610.4124	705.1904	788.9148	835.9893	816.9010	784.1078	740.1802	686.4404	593.6901	507.5125	473.0068	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.6710	58.8183	58.9635	59.6551	59.7863	60.4048	60.4048	60.5207	60.1650	59.7863	59.5215	59.2471	
alpha	4.9114	4.9212	4.9309	4.9770	4.9858	5.0270	5.0270	5.0347	5.0110	4.9858	4.9681	4.9498	
util living area													
	0.9949	0.9868	0.9648	0.9026	0.7756	0.5919	0.4354	0.4790	0.7229	0.9362	0.9885	0.9963	(86)
MIT	19.8431	20.0508	20.3378	20.6600	20.8799	20.9758	20.9957	20.9932	20.9364	20.6328	20.1713	19.8053	(87)
Th 2	19.9331	19.9355	19.9378	19.9488	19.9509	19.9605	19.9605	19.9623	19.9568	19.9509	19.9467	19.9424	(88)
util rest of house													
	0.9933	0.9825	0.9536	0.8731	0.7162	0.5048	0.3346	0.3744	0.6378	0.9099	0.9841	0.9950	(89)
MIT 2	18.4096	18.7119	19.1232	19.5718	19.8422	19.9457	19.9590	19.9597	19.9113	19.5488	18.8971	18.3613	(90)
Living area fraction									fLA = Living area / (4) =			0.4581	(91)
MIT	19.0664	19.3253	19.6797	20.0704	20.3176	20.4177	20.4340	20.4332	20.3810	20.0454	19.4809	19.0229	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0664	19.3253	19.6797	20.0704	20.3176	20.4177	20.4340	20.4332	20.3810	20.0454	19.4809	19.0229	(93)

---
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9914	0.9794	0.9503	0.8769	0.7382	0.5441	0.3809	0.4224	0.6743	0.9127	0.9816	0.9936	(94)
Useful gains	500.2966	597.8508	670.1137	691.7893	617.1611	444.4586	298.6788	312.6867	462.8706	541.8395	498.1606	469.9581	(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													
	1190.2402	1159.8384	1057.0747	885.5330	681.6656	455.4733	300.1674	315.1596	493.7039	747.1442	983.6980	1183.1778	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	513.3180	377.6556	287.8990	139.4955	47.9913	0.0000	0.0000	0.0000	0.0000	152.7467	349.5869	530.6354	(98)
Space heating												2399.3285	(98)
Space heating per m2											(98) / (4) =	35.2324	(99)

8c. Space cooling requirement

Not applicable

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												2566.1267	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	513.3180	377.6556	287.8990	139.4955	47.9913	0.0000	0.0000	0.0000	0.0000	152.7467	349.5869	530.6354	(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)													
	549.0032	403.9098	307.9134	149.1930	51.3276	0.0000	0.0000	0.0000	0.0000	163.3654	373.8897	567.5245	(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													
	168.2495	147.9322	154.5052	137.3161	133.7052	118.2348	112.3764	124.9323	125.2194	142.4471	152.1163	163.8008	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.6004	87.2088	86.4517	84.8558	82.3724	79.8000	79.8000	79.8000	79.8000	85.0002	86.9645	87.7255	(217)
Fuel for water heating, kWh/month													
	192.0646	169.6300	178.7186	161.8228	162.3181	148.1639	140.8225	156.5567	156.9166	167.5844	174.9177	186.7198	(219)
Water heating fuel used												1996.2358	(219)
Annual totals kWh/year													
Space heating fuel - main system												2566.1267	(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)												303.7325	(232)
Total delivered energy for all uses												4941.0950	(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	2566.1267	0.2160	554.2834	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1996.2358	0.2160	431.1869	(264)
Space and water heating			985.4703	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	303.7325	0.5190	157.6372	(268)
Total CO2, kg/m2/year			1182.0325	(272)
Emissions per m2 for space and water heating			14.4709	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.3148	(272b)
Emissions per m2 for pumps and fans			0.5716	(272c)
Target Carbon Dioxide Emission Rate (TER) = (14.4709 * 1.00) + 2.3148 + 0.5716, rounded to 2 d.p.			17.3600	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	A-3-06	**Issued on Date**	05/02/2020
Assessment Reference	ASHP - be lean	**Prop Type Ref**	2bed 3F
Property			

SAP Rating	83 B	**DER**	17.25	**TER**	17.36
Environmental	88 B	**% DER<TER**	0.62		
CO_2 Emissions (t/year)	0.97	**DFEE**	45.21	**TFEE**	48.34
General Requirements Compliance	Fail	**% DFEE<TFEE**	6.46		

Assessor Details	Miss Claudia Cioli, Claudia Cioli, Tel: 07481524839, clacioli@gmail.com	**Assessor ID**	R479-0001
Client			

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

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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England
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DWELLING AS DESIGNED

Mid-floor flat, total floor area 68 m²

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

1a TER and DER
Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 17.36 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 17.25 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)48.3 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)45.2 kWh/m²/yrOK

---
2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.18 (max. 0.20)	0.18 (max. 0.35)	OK
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction

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

---
4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage Measured cylinder loss: 0.74 kWh/day
Permitted by DBSCG 0.32 Fail
Primary pipework insulated: No primary pipework

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

Hot water controls: No cylinderstat

---
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: 94%
Minimum: 70% OK

---
9 Summertime temperature
Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing South East: 7.61 m², No overhang
Windows facing South: 3.80 m², No overhang
Windows facing West: 8.40 m², No overhang
Air change rate: 0.50 ach
Blinds/curtains: None

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10 Key features
Party wall U-value 0.00 W/m²K
Air permeability 3.0 m³/m²h

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	68.1000 (1b)	x	2.4000 (2b)	=	163.4400	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.1000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	163.4400	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							0 * 10 =	0.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.0000	
Infiltration rate		0.1500	(18)
Number of sides sheltered		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

If mechanical ventilation:	0.5000	(23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	79.9000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2774	0.2739	0.2705	0.2531	0.2497	0.2323	0.2323	0.2288	0.2393	0.2497	0.2566	0.2635	(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	
W03 (Uw = 1.40)			8.4000	1.3258	11.1364			(27)
W02 (Uw = 1.40)			11.4100	1.3258	15.1269			(27)
door			2.1000	1.4000	2.9400			(26a)
External Wall 1	62.2000	19.8100	42.3900	0.1500	6.3585	140.0000	5934.6000	(29a)
Corridor wall	4.1500	2.1000	2.0500	0.1409	0.2889	110.0000	225.5000	(29a)
Exposed ceiling	9.6000		9.6000	0.1800	1.7280	9.0000	86.4000	(30)
Total net area of external elements Aum(A, m2)			75.9500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	37.5786			(33)
Party Wall 1			31.9000	0.0000	0.0000	140.0000	4466.0000	(32)
Party Floor			68.1000			80.0000	5448.0000	(32d)
Party Ceilings			58.5000			80.0000	4680.0000	(32b)
Internal Wall			109.6000			9.0000	986.4000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 21826.9000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	320.5125	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	18.3210	(36)
Total fabric heat loss	(33) + (36) = 55.8996	(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	14.9620	14.7749	14.5878	13.6523	13.4653	12.5298	12.5298	12.3427	12.9040	13.4653	13.8394	14.2136	(38)
Heat transfer coeff	70.8616	70.6745	70.4874	69.5520	69.3649	68.4294	68.4294	68.2424	68.8036	69.3649	69.7391	70.1132	(39)
Average = Sum(39)m / 12 =												69.5052	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0406	1.0378	1.0351	1.0213	1.0186	1.0048	1.0048	1.0021	1.0103	1.0186	1.0241	1.0296	(40)
HLP (average)												1.0206	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.1991 (42)
Average daily hot water use (litres/day)	90.9782 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												

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	100.0760	96.4369	92.7978	89.1586	85.5195	81.8804	81.8804	85.5195	89.1586	92.7978	96.4369	100.0760	(44)
Energy conte	148.4098	129.8002	133.9422	116.7740	112.0475	96.6884	89.5960	102.8128	104.0407	121.2494	132.3532	143.7270	(45)
Energy content (annual)										Total = Sum(45)m =		1431.4411	(45)
Distribution loss (46)m = 0.15 x (45)m													
	22.2615	19.4700	20.0913	17.5161	16.8071	14.5033	13.4394	15.4219	15.6061	18.1874	19.8530	21.5590	(46)
Water storage loss:													
Store volume												2.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.7400	(48)
Temperature factor from Table 2b												1.0000	(49)
Enter (49) or (54) in (55)												0.7400	(55)
Total storage loss													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(56)
If cylinder contains dedicated solar storage													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(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													
	194.6122	171.5314	180.1446	161.4860	158.2499	141.4004	135.7984	149.0152	148.7527	167.4518	177.0652	189.9294	(62)
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													
	194.6122	171.5314	180.1446	161.4860	158.2499	141.4004	135.7984	149.0152	148.7527	167.4518	177.0652	189.9294	(64)
									Total per year (kWh/year) = Sum(64)m =			1975.4371	(64)
Heat gains from water heating, kWh/month													
	86.3082	76.5435	81.4977	74.5970	74.2177	67.9185	66.7526	71.1472	70.3631	77.2773	79.7770	84.7511	(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	109.9564	109.9564	109.9564	109.9564	109.9564	109.9564	109.9564	109.9564	109.9564	109.9564	109.9564	109.9564	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	17.1903	15.2682	12.4170	9.4004	7.0269	5.9324	6.4102	8.3322	11.1835	14.2000	16.5735	17.6680	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	192.8226	194.8235	189.7813	179.0470	165.4970	152.7619	144.2540	142.2532	147.2953	158.0296	171.5796	184.3147	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.9956	33.9956	33.9956	33.9956	33.9956	33.9956	33.9956	33.9956	33.9956	33.9956	33.9956	33.9956	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	(71)
Water heating gains (Table 5)													
	116.0056	113.9040	109.5399	103.6069	99.7550	94.3313	89.7212	95.6279	97.7266	103.8674	110.8014	113.9128	(72)
Total internal gains													
	382.0054	379.9827	367.7251	348.0413	328.2658	309.0125	296.3724	302.2002	312.1923	332.0839	354.9415	371.8825	(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	8.4000	19.6403	0.3700	0.8900	0.7700	37.6488	(80)
Southeast	7.6100	36.7938	0.5600	0.6800	0.7700	73.8907	(77)
South	3.8000	46.7521	0.5600	0.6800	0.7700	46.8829	(78)

Solar gains	158.4225	276.2945	391.3080	500.8150	570.9840	570.0534	548.3507	496.3150	429.7043	309.3133	191.0200	134.7068	(83)
Total gains	540.4278	656.2771	759.0330	848.8563	899.2499	879.0659	844.7231	798.5152	741.8966	641.3972	545.9614	506.5893	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	85.5616	85.7881	86.0158	87.1726	87.4077	88.6026	88.6026	88.8455	88.1208	87.4077	86.9388	86.4748	
alpha	6.7041	6.7192	6.7344	6.8115	6.8272	6.9068	6.9068	6.9230	6.8747	6.8272	6.7959	6.7650	
util living area													
	0.9972	0.9894	0.9614	0.8682	0.6947	0.4962	0.3563	0.3928	0.6289	0.9174	0.9911	0.9981	(86)
MIT	20.2612	20.4397	20.6646	20.8797	20.9765	20.9979	20.9998	20.9997	20.9906	20.8470	20.5078	20.2281	(87)
Th 2	20.0497	20.0519	20.0542	20.0656	20.0679	20.0793	20.0793	20.0816	20.0747	20.0679	20.0633	20.0588	(88)
util rest of house													
	0.9960	0.9852	0.9475	0.8301	0.6336	0.4258	0.2818	0.3146	0.5498	0.8823	0.9869	0.9973	(89)
MIT 2	19.0796	19.3393	19.6573	19.9444	20.0498	20.0783	20.0793	20.0815	20.0693	19.9149	19.4485	19.0385	(90)
Living area fraction									fLA = Living area / (4) =			0.4581	(91)
MIT	19.6209	19.8435	20.1188	20.3729	20.4744	20.4996	20.5010	20.5022	20.4914	20.3419	19.9338	19.5835	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6209	19.8435	20.1188	20.3729	20.4744	20.4996	20.5010	20.5022	20.4914	20.3419	19.9338	19.5835	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9953	0.9841	0.9486	0.8435	0.6608	0.4581	0.3159	0.3504	0.5860	0.8938	0.9861	0.9968	(94)
Useful gains	537.8893	645.8521	720.0142	715.9934	594.2683	402.6947	266.8802	279.8121	434.7547	573.2870	538.3992	504.9669	(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													
	1085.6659	1056.1215	959.9541	797.9637	608.6360	403.7081	266.9442	279.9404	439.7517	675.7485	895.0202	1078.5859	(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													
	407.5457	275.7010	178.5153	59.0186	10.6896	0.0000	0.0000	0.0000	0.0000	76.2314	256.7671	426.7725	(98)

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Space heating		1691.2413 (98)
Space heating per m2	(98) / (4) =	24.8347 (99)

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1000 (306)
Space heating:	
Annual space heating requirement	1691.2413 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.10	1860.3655 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1975.4371 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.10	2172.9808 (310a)
Electricity used for heat distribution	40.3335 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.2500, SFP = 0.6625)	
mechanical ventilation fans (SFP = 0.6625)	132.1004 (330a)
Total electricity for the above, kWh/year	132.1004 (331)
Electricity for lighting (calculated in Appendix L)	303.5856 (332)
Total delivered energy for all uses	4469.0323 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Boilers			93.9000	(367a)
Space heating from Boilers	4295.3635	0.2160	927.7985	(367)
Electrical energy for heat distribution	40.3335	0.5190	20.9331	(372)
Total CO2 associated with community systems			948.7316	(373)
(negative value allowed since DFEE <= TFEE)				
Space and water heating			948.7316	(376)
Pumps and fans	132.1004	0.5190	68.5601	(378)
Energy for lighting	303.5856	0.5190	157.5609	(379)
Total CO2, kg/year			1174.8526	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			17.2500	(384)

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

DER		17.2500	ZC1
Total Floor Area	TFA	68.1000	
Assumed number of occupants	N	2.1991	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.7786	ZC2
CO2 emissions from cooking, equation (L16)		2.5225	ZC3
Total CO2 emissions		36.5511	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		36.5511	ZC8

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1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	68.1000 (1b)	x	2.4000 (2b)	=	163.4400	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.1000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	163.4400	(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)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1224	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3724	(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) =	0.3444	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4392	0.4306	0.4219	0.3789	0.3703	0.3272	0.3272	0.3186	0.3444	0.3703	0.3875	0.4047	(22b)
Effective ac	0.5964	0.5927	0.5890	0.5718	0.5686	0.5535	0.5535	0.5508	0.5593	0.5686	0.5751	0.5819	(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 Semi-glazed door			2.1000	1.2000	2.5200			(26a)
TER Opening Type (Uw = 1.40)			14.9200	1.3258	19.7803			(27)
External Wall 1	62.2000	14.9200	47.2800	0.1800	8.5104			(29a)
Corridor wall	4.1500	2.1000	2.0500	0.1800	0.3690			(29a)
Exposed ceiling	9.6000		9.6000	0.1300	1.2480			(30)
Total net area of external elements Aum(A, m2)			75.9500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.4277			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							16.0085	(36)
Total fabric heat loss					(33) + (36) =		48.4362	(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	32.1687	31.9667	31.7687	30.8389	30.6649	29.8551	29.8551	29.7051	30.1670	30.6649	31.0169	31.3848	(38)
Heat transfer coeff	80.6049	80.4029	80.2050	79.2751	79.1011	78.2913	78.2913	78.1413	78.6032	79.1011	79.4531	79.8210	(39)
Average = Sum(39)m / 12 =												79.2743	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1836	1.1807	1.1778	1.1641	1.1615	1.1497	1.1497	1.1474	1.1542	1.1615	1.1667	1.1721	(40)
HLP (average)												1.1641	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1991	(42)
Average daily hot water use (litres/day)												86.4293	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.0722	91.6150	88.1579	84.7007	81.2435	77.7863	77.7863	81.2435	84.7007	88.1579	91.6150	95.0722	(44)
Energy conte	140.9893	123.3102	127.2451	110.9353	106.4451	91.8540	85.1162	97.6721	98.8386	115.1869	125.7355	136.5406	(45)
Energy content (annual)										Total = Sum(45)m =		1359.8691	(45)
Distribution loss (46)m = 0.15 x (45)m	21.1484	18.4965	19.0868	16.6403	15.9668	13.7781	12.7674	14.6508	14.8258	17.2780	18.8603	20.4811	(46)
Water storage loss:													
Store volume												2.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.2388	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.1290	(55)

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Total storage loss
3.9977 3.6109 3.9977 3.8688 3.9977 3.8688 3.9977 3.9977 3.8688 3.9977 3.8688 3.9977 (56)
If cylinder contains dedicated solar storage
3.9977 3.6109 3.9977 3.8688 3.9977 3.8688 3.9977 3.9977 3.8688 3.9977 3.8688 3.9977 (57)
Primary loss 23.2624 21.0112 23.2624 22.5120 23.2624 22.5120 23.2624 23.2624 22.5120 23.2624 22.5120 23.2624 (59)
Total heat required for water heating calculated for each month
168.2495 147.9322 154.5052 137.3161 133.7052 118.2348 112.3764 124.9323 125.2194 142.4471 152.1163 163.8008 (62)
Solar input 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)
Output from w/h
168.2495 147.9322 154.5052 137.3161 133.7052 118.2348 112.3764 124.9323 125.2194 142.4471 152.1163 163.8008 (64)
Total per year (kWh/year) = Sum(64)m = 1680.8353 (64)
Heat gains from water heating, kWh/month
68.6871 60.6983 64.1171 57.9906 57.2011 51.6461 50.1093 54.2841 53.9685 60.1078 62.9117 67.2079 (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	109.9564	109.9564	109.9564	109.9564	109.9564	109.9564	109.9564	109.9564	109.9564	109.9564	109.9564	109.9564	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	17.1986	15.2756	12.4230	9.4050	7.0303	5.9353	6.4133	8.3363	11.1889	14.2069	16.5816	17.6766	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	192.8226	194.8235	189.7813	179.0470	165.4970	152.7619	144.2540	142.2532	147.2953	158.0296	171.5796	184.3147	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.9956	33.9956	33.9956	33.9956	33.9956	33.9956	33.9956	33.9956	33.9956	33.9956	33.9956	33.9956	(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)													
	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	(71)
Water heating gains (Table 5)													
	92.3213	90.3248	86.1789	80.5425	76.8832	71.7307	67.3512	72.9625	74.9562	80.7900	87.3773	90.3332	(72)
Total internal gains													
	361.3294	359.4108	347.3701	327.9815	308.3975	289.4148	277.0054	282.5388	292.4274	312.0134	334.5254	351.3114	(73)

---
6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	5.7300	36.7938	0.6300	0.7000	0.7700	64.4320	(77)
South	2.8600	46.7521	0.6300	0.7000	0.7700	40.8638	(78)
West	6.3300	19.6403	0.6300	0.7000	0.7700	37.9947	(80)

Solar gains	143.2905	251.0015	357.8203	460.9333	527.5918	527.4862	507.1024	457.6414	394.0130	281.6767	172.9871	121.6954	(83)
Total gains	504.6199	610.4124	705.1904	788.9148	835.9893	816.9010	784.1078	740.1802	686.4404	593.6901	507.5125	473.0068	(84)

---
7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.6710	58.8183	58.9635	59.6551	59.7863	60.4048	60.4048	60.5207	60.1650	59.7863	59.5215	59.2471	
alpha	4.9114	4.9212	4.9309	4.9770	4.9858	5.0270	5.0270	5.0347	5.0110	4.9858	4.9681	4.9498	
util living area													
	0.9949	0.9868	0.9648	0.9026	0.7756	0.5919	0.4354	0.4790	0.7229	0.9362	0.9885	0.9963	(86)
MIT	19.8431	20.0508	20.3378	20.6600	20.8799	20.9758	20.9957	20.9932	20.9364	20.6328	20.1713	19.8053	(87)
Th 2	19.9331	19.9355	19.9378	19.9488	19.9509	19.9605	19.9605	19.9623	19.9568	19.9509	19.9467	19.9424	(88)
util rest of house													
	0.9933	0.9825	0.9536	0.8731	0.7162	0.5048	0.3346	0.3744	0.6378	0.9099	0.9841	0.9950	(89)
MIT 2	18.4096	18.7119	19.1232	19.5718	19.8422	19.9457	19.9590	19.9597	19.9113	19.5488	18.8971	18.3613	(90)
Living area fraction									fLA = Living area / (4) =			0.4581	(91)
MIT	19.0664	19.3253	19.6797	20.0704	20.3176	20.4177	20.4340	20.4332	20.3810	20.0454	19.4809	19.0229	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0664	19.3253	19.6797	20.0704	20.3176	20.4177	20.4340	20.4332	20.3810	20.0454	19.4809	19.0229	(93)

---
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9914	0.9794	0.9503	0.8769	0.7382	0.5441	0.3809	0.4224	0.6743	0.9127	0.9816	0.9936	(94)
Useful gains	500.2966	597.8508	670.1137	691.7893	617.1611	444.4586	298.6788	312.6867	462.8706	541.8395	498.1606	469.9581	(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													
	1190.2402	1159.8384	1057.0747	885.5330	681.6656	455.4733	300.1674	315.1596	493.7039	747.1442	983.6980	1183.1778	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	513.3180	377.6556	287.8990	139.4955	47.9913	0.0000	0.0000	0.0000	0.0000	152.7467	349.5869	530.6354	(98)
Space heating												2399.3285	(98)
Space heating per m2											(98) / (4) =	35.2324	(99)

8c. Space cooling requirement

Not applicable

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												2566.1267	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	513.3180	377.6556	287.8990	139.4955	47.9913	0.0000	0.0000	0.0000	0.0000	152.7467	349.5869	530.6354	(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)													
	549.0032	403.9098	307.9134	149.1930	51.3276	0.0000	0.0000	0.0000	0.0000	163.3654	373.8897	567.5245	(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													
	168.2495	147.9322	154.5052	137.3161	133.7052	118.2348	112.3764	124.9323	125.2194	142.4471	152.1163	163.8008	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.6004	87.2088	86.4517	84.8558	82.3724	79.8000	79.8000	79.8000	79.8000	85.0002	86.9645	87.7255	(217)
Fuel for water heating, kWh/month													
	192.0646	169.6300	178.7186	161.8228	162.3181	148.1639	140.8225	156.5567	156.9166	167.5844	174.9177	186.7198	(219)
Water heating fuel used												1996.2358	(219)
Annual totals kWh/year													
Space heating fuel - main system												2566.1267	(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)												303.7325	(232)
Total delivered energy for all uses												4941.0950	(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	2566.1267	0.2160	554.2834	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1996.2358	0.2160	431.1869	(264)
Space and water heating			985.4703	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	303.7325	0.5190	157.6372	(268)
Total CO2, kg/m2/year			1182.0325	(272)
Emissions per m2 for space and water heating			14.4709	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.3148	(272b)
Emissions per m2 for pumps and fans			0.5716	(272c)
Target Carbon Dioxide Emission Rate (TER) = (14.4709 * 1.00) + 2.3148 + 0.5716, rounded to 2 d.p.			17.3600	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	A-4-01	**Issued on Date**	05/02/2020
Assessment Reference	ASHP - Be Lean	**Prop Type Ref**	2bed 3F
Property			

SAP Rating	84 B	**DER**	15.50	**TER**	16.29
Environmental	88 B	**% DER<TER**	4.87		
CO_2 Emissions (t/year)	1.16	**DFEE**	46.01	**TFEE**	49.65
General Requirements Compliance	Fail	**% DFEE<TFEE**	7.32		

Assessor Details	Miss Claudia Cioli, Claudia Cioli, Tel: 07481524839, clacioli@gmail.com	**Assessor ID**	R479-0001
Client			

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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England
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DWELLING AS DESIGNED

Top-floor flat, total floor area 92 m²

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

1a TER and DER
Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 16.29 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 15.50 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)49.6 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)46.0 kWh/m²/yrOK

---
2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	OK
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction

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

---
4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage Nominal cylinder loss: 0.09 kWh/day
Permitted by DBSCG 0.32 OK
Primary pipework insulated: No primary pipework

---
6 Controls
Space heating controls: Charging system linked to use of community heating, programmer and TRVsOK

Hot water controls: No cylinderstat

---
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: 94%
Minimum: 70% OK

---
9 Summertime temperature
Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing North East: 12.22 m², No overhang
Windows facing North West: 16.76 m², No overhang
Air change rate: 0.50 ach
Blinds/curtains: None

---
10 Key features
Party wall U-value 0.00 W/m²K
Roof U-value 0.11 W/m²K
Air permeability 3.0 m³/m²h

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	91.9000 (1b)	x	2.5000 (2b)	=	229.7500	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	91.9000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	229.7500	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							0 * 10 =	0.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.0000	
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	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) =	79.9000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2631	0.2599	0.2567	0.2408	0.2376	0.2216	0.2216	0.2184	0.2280	0.2376	0.2439	0.2503	(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	
W03 (Uw = 1.40)			8.4000	1.3258	11.1364			(27)
W02 (Uw = 1.40)			16.7600	1.3258	22.2197			(27)
door			2.1000	1.4000	2.9400			(26a)
W31 (Uw = 1.40)			3.8200	1.3258	5.0644			(27)
External Wall 1	54.9000	28.9800	25.9200	0.1500	3.8880	140.0000	3628.8000	(29a)
Corridor wall	7.6000	2.1000	5.5000	0.1409	0.7750	110.0000	605.0000	(29a)
roof	91.9000		91.9000	0.1100	10.1090	9.0000	827.1000	(30)
Total net area of external elements Aum(A, m2)			154.4000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	56.1325			(33)
Party Wall 1			38.9000	0.0000	0.0000	140.0000	5446.0000	(32)
Party Floor			91.9000			80.0000	7352.0000	(32d)
Internal Wall			163.4000			9.0000	1470.6000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 19329.5000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	210.3319	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	6.4040	(36)
Total fabric heat loss	(33) + (36) = 62.5365	(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	19.9447	19.7031	19.4614	18.2531	18.0114	16.8031	16.8031	16.5614	17.2864	18.0114	18.4947	18.9781	(38)
Heat transfer coeff	82.4812	82.2395	81.9979	80.7895	80.5479	79.3395	79.3395	79.0979	79.8229	80.5479	81.0312	81.5145	(39)
Average = Sum(39)m / 12 =												80.7291	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8975	0.8949	0.8923	0.8791	0.8765	0.8633	0.8633	0.8607	0.8686	0.8765	0.8817	0.8870	(40)
HLP (average)												0.8784	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6508	(42)
Average daily hot water use (litres/day)	102.2711	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	112.4982	108.4074	104.3165	100.2257	96.1348	92.0440	92.0440	96.1348	100.2257	104.3165	108.4074	112.4982	(44)
Energy conte	166.8316	145.9120	150.5681	131.2689	125.9556	108.6901	100.7174	115.5747	116.9550	136.2998	148.7819	161.5675	(45)
Energy content (annual)										Total = Sum(45)m =		1609.1225	(45)
Distribution loss (46)m = 0.15 x (45)m													
	25.0247	21.8868	22.5852	19.6903	18.8933	16.3035	15.1076	17.3362	17.5433	20.4450	22.3173	24.2351	(46)
Water storage loss:													
Store volume												2.0000	(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												3.9149	(52)
Temperature factor from Table 2b												1.0000	(53)
Enter (49) or (54) in (55)												0.0904	(55)
Total storage loss													
	2.8029	2.5316	2.8029	2.7124	2.8029	2.7124	2.8029	2.8029	2.7124	2.8029	2.7124	2.8029	(56)
If cylinder contains dedicated solar storage													
	2.8029	2.5316	2.8029	2.7124	2.8029	2.7124	2.8029	2.8029	2.7124	2.8029	2.7124	2.8029	(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													
	192.8968	169.4548	176.6333	156.4933	152.0209	133.9146	126.7826	141.6399	142.1794	162.3650	174.0063	187.6327	(62)
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													
	192.8968	169.4548	176.6333	156.4933	152.0209	133.9146	126.7826	141.6399	142.1794	162.3650	174.0063	187.6327	(64)
									Total per year (kWh/year) = Sum(64)m =			1916.0199	(64)
Heat gains from water heating, kWh/month													
	76.3237	67.3500	70.9161	63.8265	62.7325	56.3190	54.3407	59.2808	59.0671	66.1719	69.6495	74.5734	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	132.5422	132.5422	132.5422	132.5422	132.5422	132.5422	132.5422	132.5422	132.5422	132.5422	132.5422	132.5422	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	21.6217	19.2042	15.6179	11.8238	8.8384	7.4618	8.0627	10.4802	14.0665	17.8607	20.8460	22.2227	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	242.5301	245.0468	238.7048	225.2034	208.1603	192.1422	181.4412	178.9245	185.2665	198.7679	215.8110	231.8290	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.2542	36.2542	36.2542	36.2542	36.2542	36.2542	36.2542	36.2542	36.2542	36.2542	36.2542	36.2542	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	(71)
Water heating gains (Table 5)													
	102.5856	100.2232	95.3173	88.6479	84.3178	78.2209	73.0386	79.6785	82.0376	88.9407	96.7355	100.2331	(72)
Total internal gains													
	429.5001	427.2369	412.4027	388.4377	364.0792	340.5875	325.3051	331.8458	344.1333	368.3319	396.1551	417.0474	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	8.4000	11.2829	0.3700	0.8900	0.7700	21.6285	(75)
Northwest	16.7600	11.2829	0.5600	0.6800	0.7700	49.9030	(81)
Northeast	3.8200	11.2829	0.3700	0.8800	0.7700	9.7253	(75)

Solar gains	81.2568	165.4006	297.9992	489.4003	657.8501	701.3378	656.0871	523.0403	363.1167	202.1326	102.2421	66.3584	(83)
Total gains	510.7569	592.6375	710.4019	877.8380	1021.9293	1041.9253	981.3923	854.8861	707.2500	570.4645	498.3972	483.4058	(84)

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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	65.0973	65.2886	65.4810	66.4604	66.6598	67.6750	67.6750	67.8818	67.2653	66.6598	66.2622	65.8693	
alpha	5.3398	5.3526	5.3654	5.4307	5.4440	5.5117	5.5117	5.5255	5.4844	5.4440	5.4175	5.3913	
util living area													
	0.9968	0.9925	0.9736	0.8861	0.6913	0.4825	0.3549	0.4234	0.7243	0.9570	0.9932	0.9976	(86)
MIT	19.9291	20.0919	20.3859	20.7527	20.9472	20.9938	20.9991	20.9977	20.9522	20.6385	20.2187	19.9032	(87)
Th 2	20.1696	20.1719	20.1741	20.1853	20.1875	20.1988	20.1988	20.2010	20.1943	20.1875	20.1831	20.1786	(88)
util rest of house													
	0.9960	0.9904	0.9665	0.8600	0.6421	0.4241	0.2907	0.3510	0.6576	0.9414	0.9910	0.9970	(89)
MIT 2	18.7240	18.9627	19.3880	19.9010	20.1378	20.1945	20.1984	20.1999	20.1554	19.7607	19.1567	18.6929	(90)
Living area fraction										fLA = Living area / (4) =		0.3297	(91)
MIT	19.1213	19.3350	19.7170	20.1818	20.4046	20.4581	20.4624	20.4630	20.4181	20.0501	19.5068	19.0919	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1213	19.3350	19.7170	20.1818	20.4046	20.4581	20.4624	20.4630	20.4181	20.0501	19.5068	19.0919	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9945	0.9877	0.9617	0.8599	0.6557	0.4432	0.3119	0.3749	0.6770	0.9383	0.9886	0.9958	(94)
Useful gains	507.9317	585.3460	683.1694	754.8636	670.0946	461.7515	306.0934	320.4689	478.8344	535.2426	492.7198	481.3682	(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													
	1222.4820	1187.1261	1083.7689	911.4508	701.1401	464.7757	306.4384	321.3709	504.3283	761.1856	1005.3398	1213.9101	(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)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Space heating kWh

531.6254	404.3963	298.0461	112.7428	23.0979	0.0000	0.0000	0.0000	0.0000	168.1016	369.0864	545.0111 (98)

Space heating 2452.1076 (98)
Space heating per m2 (98) / (4) = 26.6823 (99)

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (301)
Fraction of space heat from community system 1.0000 (302)
Fraction of heat from community Boilers 1.0000 (303a)
Fraction of total space heat from community Boilers 1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating 1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating 1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system 1.1000 (306)
Space heating:
Annual space heating requirement 2452.1076 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.10 2697.3183 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0.0000 (308)
Space heating fuel for secondary/supplementary system 0.0000 (309)

Water heating
Annual water heating requirement 1916.0199 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.10 2107.6219 (310a)
Electricity used for heat distribution 48.0494 (313)
Annual totals kWh/year

Electricity for pumps and fans:
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.2500, SFP = 0.6625)
mechanical ventilation fans (SFP = 0.6625) 185.6954 (330a)
Total electricity for the above, kWh/year 185.6954 (331)
Electricity for lighting (calculated in Appendix L) 381.8466 (332)
Total delivered energy for all uses 5372.4823 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Boilers			93.9000	(367a)
Space heating from Boilers	5117.0823	0.2160	1105.2898	(367)
Electrical energy for heat distribution	48.0494	0.5190	24.9376	(372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			1130.2274	(373)
Space and water heating			1130.2274	(376)
Pumps and fans	185.6954	0.5190	96.3759	(378)
Energy for lighting	381.8466	0.5190	198.1784	(379)
Total CO2, kg/year			1424.7817	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			15.5000	(384)

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

DER		15.5000	ZC1
Total Floor Area	TFA	91.9000	
Assumed number of occupants	N	2.6508	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		15.6385	ZC2
CO2 emissions from cooking, equation (L16)		1.9872	ZC3
Total CO2 emissions		33.1257	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		33.1257	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	91.9000 (1b)	x	2.5000 (2b)	=	229.7500	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	91.9000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	229.7500	(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							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) =	0.1306	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3806	(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) =	0.3235	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4125	0.4044	0.3963	0.3558	0.3478	0.3073	0.3073	0.2992	0.3235	0.3478	0.3639	0.3801	(22b)
Effective ac	0.5851	0.5818	0.5785	0.5633	0.5605	0.5472	0.5472	0.5448	0.5523	0.5605	0.5662	0.5722	(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 Semi-glazed door			2.1000	1.2000	2.5200			(26a)
TER Opening Type (Uw = 1.40)			20.8700	1.3258	27.6686			(27)
External Wall 1	54.9000	20.8700	34.0300	0.1800	6.1254			(29a)
Corridor wall	7.6000	2.1000	5.5000	0.1800	0.9900			(29a)
roof	91.9000		91.9000	0.1300	11.9470			(30)
Total net area of external elements Aum(A, m2)			154.4000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	49.2510			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	4.1715	(36)
Total fabric heat loss (33) + (36) =	53.4225	(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	44.3576	44.1072	43.8617	42.7088	42.4931	41.4890	41.4890	41.3030	41.8757	42.4931	42.9295	43.3857	(38)
Heat transfer coeff	97.7801	97.5296	97.2842	96.1313	95.9156	94.9114	94.9114	94.7255	95.2982	95.9156	96.3519	96.8081	(39)
Average = Sum(39)m / 12 =												96.1302	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0640	1.0613	1.0586	1.0460	1.0437	1.0328	1.0328	1.0307	1.0370	1.0437	1.0484	1.0534	(40)
HLP (average)												1.0460	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6508 (42)
Average daily hot water use (litres/day)	97.1575 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	106.8733	102.9870	99.1007	95.2144	91.3281	87.4418	87.4418	91.3281	95.2144	99.1007	102.9870	106.8733	(44)
Energy conte	158.4900	138.6164	143.0397	124.7055	119.6579	103.2556	95.6815	109.7959	111.1073	129.4848	141.3428	153.4891	(45)
Energy content (annual)										Total = Sum(45)m =		1528.6664	(45)
Distribution loss (46)m = 0.15 x (45)m	23.7735	20.7925	21.4560	18.7058	17.9487	15.4883	14.3522	16.4694	16.6661	19.4227	21.2014	23.0234	(46)

Water storage loss:	
Store volume	2.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	0.2388 (48)
Temperature factor from Table 2b	0.5400 (49)
Enter (49) or (54) in (55)	0.1290 (55)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss
3.9977 3.6109 3.9977 3.8688 3.9977 3.8688 3.9977 3.9977 3.8688 3.9977 3.8688 3.9977 (56)
If cylinder contains dedicated solar storage
3.9977 3.6109 3.9977 3.8688 3.9977 3.8688 3.9977 3.9977 3.8688 3.9977 3.8688 3.9977 (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
185.7501 163.2384 170.2998 151.0862 146.9180 129.6364 122.9417 137.0561 137.4880 156.7449 167.7236 180.7492 (62)
Solar input 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)
Output from w/h
185.7501 163.2384 170.2998 151.0862 146.9180 129.6364 122.9417 137.0561 137.4880 156.7449 167.7236 180.7492 (64)
Total per year (kWh/year) = Sum(64)m = 1849.6326 (64)
Heat gains from water heating, kWh/month
74.5060 65.7876 69.3688 62.5692 61.5944 55.4371 53.6222 58.3153 58.0478 64.8618 68.1011 72.8432 (65)

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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	132.5422	132.5422	132.5422	132.5422	132.5422	132.5422	132.5422	132.5422	132.5422	132.5422	132.5422	132.5422	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	21.6173	19.2003	15.6148	11.8214	8.8366	7.4602	8.0611	10.4781	14.0636	17.8570	20.8418	22.2182	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	242.5301	245.0468	238.7048	225.2034	208.1603	192.1422	181.4412	178.9245	185.2665	198.7679	215.8110	231.8290	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.2542	36.2542	36.2542	36.2542	36.2542	36.2542	36.2542	36.2542	36.2542	36.2542	36.2542	36.2542	(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)													
	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	(71)
Water heating gains (Table 5)													
	100.1425	97.8982	93.2376	86.9017	82.7881	76.9960	72.0729	78.3807	80.6219	87.1799	94.5849	97.9076	(72)
Total internal gains													
	430.0526	427.9080	413.3199	389.6891	365.5477	342.3611	327.3378	333.5459	345.7147	369.5674	397.0003	417.7174	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	8.8000	11.2829	0.6300	0.7000	0.7700	30.3443	(75)
Northwest	12.0700	11.2829	0.6300	0.7000	0.7700	41.6199	(81)

Solar gains	71.9642	146.4852	263.9198	433.4322	582.6179	621.1323	581.0565	463.2250	321.5904	179.0166	90.5496	58.7696	(83)
Total gains	502.0169	574.3933	677.2397	823.1213	948.1656	963.4935	908.3943	796.7709	667.3051	548.5840	487.5499	476.4870	(84)

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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	65.2684	65.4359	65.6010	66.3878	66.5371	67.2411	67.2411	67.3731	66.9681	66.5371	66.2358	65.9236	
alpha	5.3512	5.3624	5.3734	5.4259	5.4358	5.4827	5.4827	5.4915	5.4645	5.4358	5.4157	5.3949	
util living area													
	0.9987	0.9971	0.9898	0.9498	0.8177	0.6109	0.4562	0.5377	0.8390	0.9822	0.9973	0.9991	(86)
MIT	19.8252	19.9639	20.2307	20.6027	20.8784	20.9803	20.9967	20.9923	20.8981	20.5220	20.1118	19.8034	(87)
Th 2	20.0304	20.0326	20.0348	20.0451	20.0471	20.0561	20.0561	20.0578	20.0526	20.0471	20.0432	20.0391	(88)
util rest of house													
	0.9983	0.9961	0.9862	0.9321	0.7654	0.5291	0.3602	0.4323	0.7694	0.9731	0.9962	0.9987	(89)
MIT 2	18.4536	18.6577	19.0472	19.5811	19.9328	20.0437	20.0549	20.0547	19.9703	19.4789	18.8821	18.4279	(90)
Living area fraction									fLA = Living area / (4) =			0.3297	(91)
MIT	18.9058	19.0884	19.4374	19.9179	20.2446	20.3525	20.3654	20.3638	20.2762	19.8228	19.2875	18.8814	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9058	19.0884	19.4374	19.9179	20.2446	20.3525	20.3654	20.3638	20.2762	19.8228	19.2875	18.8814	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9976	0.9947	0.9831	0.9293	0.7771	0.5555	0.3920	0.4672	0.7877	0.9703	0.9950	0.9982	(94)
Useful gains	500.8051	571.3717	665.8236	764.8955	736.8584	535.1999	356.0749	372.2644	525.6682	532.3126	485.1003	475.6150	(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													
	1428.1580	1383.7862	1258.6020	1059.1653	819.5555	545.9803	357.3803	375.4764	588.5820	884.6090	1174.2904	1421.2815	(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													
	689.9505	545.9426	441.0271	211.8743	61.5266	0.0000	0.0000	0.0000	0.0000	262.1085	496.2169	703.5758	(98)
Space heating												3412.2225	(98)
Space heating per m2											(98) / (4) =	37.1297	(99)

8c. Space cooling requirement

Not applicable

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												3649.4358	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	689.9505	545.9426	441.0271	211.8743	61.5266	0.0000	0.0000	0.0000	0.0000	262.1085	496.2169	703.5758	(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)													
	737.9150	583.8958	471.6868	226.6035	65.8039	0.0000	0.0000	0.0000	0.0000	280.3300	530.7133	752.4875	(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													
	185.7501	163.2384	170.2998	151.0862	146.9180	129.6364	122.9417	137.0561	137.4880	156.7449	167.7236	180.7492	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.9972	87.7905	87.2413	85.7158	82.6856	79.8000	79.8000	79.8000	79.8000	86.1759	87.5350	88.0859	(217)
Fuel for water heating, kWh/month													
	211.0864	185.9409	195.2055	176.2641	177.6827	162.4516	154.0622	171.7495	172.2908	181.8896	191.6075	205.1965	(219)
Water heating fuel used												2185.4273	(219)
Annual totals kWh/year													
Space heating fuel - main system												3649.4358	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												381.7691	(232)
Total delivered energy for all uses												6291.6322	(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	3649.4358	0.2160	788.2781	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2185.4273	0.2160	472.0523	(264)
Space and water heating			1260.3304	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	381.7691	0.5190	198.1382	(268)
Total CO2, kg/m2/year			1497.3936	(272)
Emissions per m2 for space and water heating			13.7142	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.1560	(272b)
Emissions per m2 for pumps and fans			0.4236	(272c)
Target Carbon Dioxide Emission Rate (TER) = (13.7142 * 1.00) + 2.1560 + 0.4236, rounded to 2 d.p.			16.2900	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	A-4-02	**Issued on Date**	05/02/2020
Assessment Reference	ASHP - Be Lean	**Prop Type Ref**	2bed 3F
Property			

SAP Rating	86 B	**DER**	12.20	**TER**	14.37
Environmental	90 B	**% DER<TER**	15.12		
CO_2 Emissions (t/year)	0.92	**DFEE**	32.08	**TFEE**	39.37
General Requirements Compliance	Fail	**% DFEE<TFEE**	18.52		

Assessor Details	Miss Claudia Cioli, Claudia Cioli, Tel: 07481524839, clacioli@gmail.com	**Assessor ID**	R479-0001
Client			

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

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DWELLING AS DESIGNED

Top-floor flat, total floor area 92 m²

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

1a TER and DER
Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 14.37 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 12.20 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)39.4 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)32.1 kWh/m²/yrOK

---
2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	OK
Openings	1.25 (max. 2.00)	1.25 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction

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

---
4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage Nominal cylinder loss: 0.09 kWh/day
Permitted by DBSCG 0.32 OK
Primary pipework insulated: No primary pipework

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

Hot water controls: No cylinderstat

---
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: 94%
Minimum: 70% OK

---
9 Summertime temperature
Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing South East: 16.76 m², No overhang
Air change rate: 0.50 ach
Blinds/curtains: None

---
10 Key features
Party wall U-value 0.00 W/m²K
Roof U-value 0.11 W/m²K
Thermal bridging y-value 0.039 W/m²K
Air permeability 3.0 m³/m²h

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	91.9000 (1b)	x	2.5000 (2b)	=	229.7500	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	91.9000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	229.7500	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							0 * 10 =	0.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.0000	
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	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) =	79.9000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2631	0.2599	0.2567	0.2408	0.2376	0.2216	0.2216	0.2184	0.2280	0.2376	0.2439	0.2503	(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	
W02 (Uw = 1.25)			16.7600	1.1905	19.9524			(27)
door			2.1000	1.2500	2.6250			(26a)
External Wall 1	63.4000	16.7600	46.6400	0.1500	6.9960	140.0000	6529.6000	(29a)
Corridor wall	3.5000	2.1000	1.4000	0.1409	0.1973	110.0000	154.0000	(29a)
roof	91.9000		91.9000	0.1100	10.1090	9.0000	827.1000	(30)
Total net area of external elements Aum(A, m2)			158.8000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.8797			(33)
Party Wall 1			52.3000	0.0000	0.0000	140.0000	7322.0000	(32)
Party Floor			91.9000			80.0000	7352.0000	(32d)
Internal Wall			163.4000			9.0000	1470.6000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	23655.3000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		257.4026 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)		6.1640 (36)
Total fabric heat loss	(33) + (36) =	46.0437 (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	19.9447	19.7031	19.4614	18.2531	18.0114	16.8031	16.8031	16.5614	17.2864	18.0114	18.4947	18.9781	(38)
Heat transfer coeff	65.9884	65.7467	65.5051	64.2967	64.0551	62.8467	62.8467	62.6050	63.3300	64.0551	64.5384	65.0217	(39)
Average = Sum(39)m / 12 =												64.2363	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7180	0.7154	0.7128	0.6996	0.6970	0.6839	0.6839	0.6812	0.6891	0.6970	0.7023	0.7075	(40)
HLP (average)												0.6990	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6508 (42)
Average daily hot water use (litres/day)	102.2711 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	112.4982	108.4074	104.3165	100.2257	96.1348	92.0440	92.0440	96.1348	100.2257	104.3165	108.4074	112.4982	(44)
Energy conte	166.8316	145.9120	150.5681	131.2689	125.9556	108.6901	100.7174	115.5747	116.9550	136.2998	148.7819	161.5675	(45)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy content (annual)												Total = Sum(45)m =	1609.1225 (45)
Distribution loss (46)m = 0.15 x (45)m													
	25.0247	21.8868	22.5852	19.6903	18.8933	16.3035	15.1076	17.3362	17.5433	20.4450	22.3173	24.2351 (46)	
Water storage loss:													
Store volume													2.0000 (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													3.9149 (52)
Temperature factor from Table 2b													1.0000 (53)
Enter (49) or (54) in (55)													0.0904 (55)
Total storage loss													
	2.8029	2.5316	2.8029	2.7124	2.8029	2.7124	2.8029	2.8029	2.7124	2.8029	2.7124	2.8029 (56)	
If cylinder contains dedicated solar storage													
	2.8029	2.5316	2.8029	2.7124	2.8029	2.7124	2.8029	2.8029	2.7124	2.8029	2.7124	2.8029 (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													
	192.8968	169.4548	176.6333	156.4933	152.0209	133.9146	126.7826	141.6399	142.1794	162.3650	174.0063	187.6327 (62)	
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													
	192.8968	169.4548	176.6333	156.4933	152.0209	133.9146	126.7826	141.6399	142.1794	162.3650	174.0063	187.6327 (64)	
											Total per year (kWh/year) = Sum(64)m =		1916.0199 (64)
Heat gains from water heating, kWh/month													
	76.3237	67.3500	70.9161	63.8265	62.7325	56.3190	54.3407	59.2808	59.0671	66.1719	69.6495	74.5734 (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	132.5422	132.5422	132.5422	132.5422	132.5422	132.5422	132.5422	132.5422	132.5422	132.5422	132.5422	132.5422	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	22.1407	19.6652	15.9928	12.1076	9.0506	7.6409	8.2562	10.7318	14.4042	18.2894	21.3464	22.7561	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	242.5301	245.0468	238.7048	225.2034	208.1603	192.1422	181.4412	178.9245	185.2665	198.7679	215.8110	231.8290	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.2542	36.2542	36.2542	36.2542	36.2542	36.2542	36.2542	36.2542	36.2542	36.2542	36.2542	36.2542	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	(71)
Water heating gains (Table 5)													
	102.5856	100.2232	95.3173	88.6479	84.3178	78.2209	73.0386	79.6785	82.0376	88.9407	96.7355	100.2331	(72)
Total internal gains													
	430.0191	427.6979	412.7776	388.7215	364.2914	340.7666	325.4987	332.0974	344.4709	368.7606	396.6555	417.5809	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	16.7600	36.7938	0.5600	0.6800	0.7700	162.7343	(77)

Solar gains	162.7343	277.1968	379.2727	469.9373	526.3690	522.5625	503.8060	461.7055	410.6722	306.3615	194.9182	139.2667	(83)
Total gains	592.7535	704.8947	792.0504	858.6589	890.6603	863.3292	829.3047	793.8029	755.1431	675.1221	591.5737	556.8476	(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	99.5768	99.9429	100.3116	102.1968	102.5823	104.5547	104.5547	104.9583	103.7567	102.5823	101.8141	101.0572	
alpha	7.6385	7.6629	7.6874	7.8131	7.8388	7.9703	7.9703	7.9972	7.9171	7.8388	7.7876	7.7371	
util living area													
	0.9959	0.9847	0.9482	0.8383	0.6591	0.4653	0.3334	0.3627	0.5754	0.8809	0.9863	0.9973	(86)
MIT	20.4465	20.6056	20.7847	20.9368	20.9906	20.9995	21.0000	20.9999	20.9973	20.9224	20.6597	20.4179	(87)
Th 2	20.3249	20.3272	20.3296	20.3412	20.3435	20.3551	20.3551	20.3574	20.3505	20.3435	20.3388	20.3342	(88)
util rest of house													
	0.9947	0.9804	0.9350	0.8074	0.6159	0.4187	0.2846	0.3121	0.5227	0.8491	0.9817	0.9965	(89)
MIT 2	19.5837	19.8149	20.0673	20.2739	20.3353	20.3548	20.3551	20.3574	20.3486	20.2625	19.9039	19.5497	(90)
Living area fraction										fLA = Living area / (4) =		0.3058	(91)
MIT	19.8475	20.0567	20.2867	20.4766	20.5357	20.5519	20.5523	20.5539	20.5470	20.4643	20.1350	19.8151	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8475	20.0567	20.2867	20.4766	20.5357	20.5519	20.5523	20.5539	20.5470	20.4643	20.1350	19.8151	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9936	0.9783	0.9341	0.8141	0.6287	0.4330	0.2995	0.3276	0.5388	0.8554	0.9800	0.9956	(94)
Useful gains	588.9309	689.6013	739.8243	699.0172	559.9598	373.7878	248.3761	260.0306	406.8413	577.4840	579.7237	554.4245	(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													
	1025.9550	996.5020	903.0985	744.3359	565.9702	374.0579	248.3878	260.0538	408.2885	631.8572	841.2606	1015.3235	(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													
	325.1459	206.2372	121.4760	32.6295	4.4718	0.0000	0.0000	0.0000	0.0000	40.4536	188.3065	342.9089	(98)
Space heating												1261.6294	(98)
Space heating per m2											(98) / (4) =	13.7283	(99)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Boilers	1.0000	(303a)
Fraction of total space heat from community Boilers	1.0000	(304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.1000	(306)
Space heating:		
Annual space heating requirement	1261.6294	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.10	1387.7923	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	1916.0199	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.10	2107.6219	(310a)
Electricity used for heat distribution	34.9541	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.2500, SFP = 0.6625)		
mechanical ventilation fans (SFP = 0.6625)	185.6954	(330a)
Total electricity for the above, kWh/year	185.6954	(331)
Electricity for lighting (calculated in Appendix L)	391.0125	(332)
Total delivered energy for all uses	4072.1221	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Boilers			93.9000	(367a)
Space heating from Boilers	3722.4859	0.2160	804.0570	(367)
Electrical energy for heat distribution	34.9541	0.5190	18.1412	(372)
Total CO2 associated with community systems			822.1982	(373)
(negative value allowed since DFEE <= TFEE)				
Space and water heating			822.1982	(376)
Pumps and fans	185.6954	0.5190	96.3759	(378)
Energy for lighting	391.0125	0.5190	202.9355	(379)
Total CO2, kg/year			1121.5095	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			12.2000	(384)

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

DER		12.2000	ZC1
Total Floor Area	TFA	91.9000	
Assumed number of occupants	N	2.6508	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		15.6385	ZC2
CO2 emissions from cooking, equation (L16)		1.9872	ZC3
Total CO2 emissions		29.8257	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		29.8257	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	91.9000 (1b)	x	2.5000 (2b)	=	229.7500	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	91.9000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	229.7500	(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							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) =	0.1306	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3806	(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) =	0.3235	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4125	0.4044	0.3963	0.3558	0.3478	0.3073	0.3073	0.2992	0.3235	0.3478	0.3639	0.3801	(22b)
Effective ac	0.5851	0.5818	0.5785	0.5633	0.5605	0.5472	0.5472	0.5448	0.5523	0.5605	0.5662	0.5722	(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 Semi-glazed door			2.1000	1.2000	2.5200			(26a)
TER Opening Type (Uw = 1.40)			16.7600	1.3258	22.2197			(27)
External Wall 1	63.4000	16.7600	46.6400	0.1800	8.3952			(29a)
Corridor wall	3.5000	2.1000	1.4000	0.1800	0.2520			(29a)
roof	91.9000		91.9000	0.1300	11.9470			(30)
Total net area of external elements Aum(A, m2)			158.8000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	45.3339			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	3.9315	(36)
Total fabric heat loss (33) + (36) =	49.2654	(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	44.3576	44.1072	43.8617	42.7088	42.4931	41.4890	41.4890	41.3030	41.8757	42.4931	42.9295	43.3857	(38)
Heat transfer coeff	93.6230	93.3726	93.1271	91.9742	91.7585	90.7544	90.7544	90.5684	91.1411	91.7585	92.1949	92.6511	(39)
Average = Sum(39)m / 12 =												91.9732	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0187	1.0160	1.0134	1.0008	0.9985	0.9875	0.9875	0.9855	0.9917	0.9985	1.0032	1.0082	(40)
HLP (average)												1.0008	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6508 (42)
Average daily hot water use (litres/day)	97.1575 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	106.8733	102.9870	99.1007	95.2144	91.3281	87.4418	87.4418	91.3281	95.2144	99.1007	102.9870	106.8733	(44)
Energy conte	158.4900	138.6164	143.0397	124.7055	119.6579	103.2556	95.6815	109.7959	111.1073	129.4848	141.3428	153.4891	(45)
Energy content (annual)										Total = Sum(45)m =		1528.6664	(45)
Distribution loss (46)m = 0.15 x (45)m	23.7735	20.7925	21.4560	18.7058	17.9487	15.4883	14.3522	16.4694	16.6661	19.4227	21.2014	23.0234	(46)

Water storage loss:	
Store volume	2.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	0.2388 (48)
Temperature factor from Table 2b	0.5400 (49)
Enter (49) or (54) in (55)	0.1290 (55)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss

	3.9977	3.6109	3.9977	3.8688	3.9977	3.8688	3.9977	3.9977	3.8688	3.9977	3.8688	3.9977 (56)

If cylinder contains dedicated solar storage

	3.9977	3.6109	3.9977	3.8688	3.9977	3.8688	3.9977	3.9977	3.8688	3.9977	3.8688	3.9977 (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

	185.7501	163.2384	170.2998	151.0862	146.9180	129.6364	122.9417	137.0561	137.4880	156.7449	167.7236	180.7492 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
								Solar input (sum of months) = Sum(63)m =				0.0000 (63)

Output from w/h

	185.7501	163.2384	170.2998	151.0862	146.9180	129.6364	122.9417	137.0561	137.4880	156.7449	167.7236	180.7492 (64)
								Total per year (kWh/year) = Sum(64)m =				1849.6326 (64)

Heat gains from water heating, kWh/month

	74.5060	65.7876	69.3688	62.5692	61.5944	55.4371	53.6222	58.3153	58.0478	64.8618	68.1011	72.8432 (65)

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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	132.5422	132.5422	132.5422	132.5422	132.5422	132.5422	132.5422	132.5422	132.5422	132.5422	132.5422	132.5422	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	22.0382	19.5741	15.9187	12.0515	9.0086	7.6055	8.2180	10.6821	14.3374	18.2047	21.2475	22.6507	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	242.5301	245.0468	238.7048	225.2034	208.1603	192.1422	181.4412	178.9245	185.2665	198.7679	215.8110	231.8290	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	36.2542	36.2542	36.2542	36.2542	36.2542	36.2542	36.2542	36.2542	36.2542	36.2542	36.2542	36.2542	(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)

	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	(71)

Water heating gains (Table 5)

	100.1425	97.8982	93.2376	86.9017	82.7881	76.9960	72.0729	78.3807	80.6219	87.1799	94.5849	97.9076	(72)

Total internal gains

	430.4735	428.2818	413.6239	389.9192	365.7197	342.5064	327.4947	333.7499	345.9885	369.9150	397.4060	418.1500	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	16.7600	36.7938	0.6300	0.7000	0.7700	188.4607	(77)

Solar gains	188.4607	321.0183	439.2313	544.2289	609.5817	605.1735	583.4519	534.6957	475.5946	354.7937	225.7325	161.2831	(83)
Total gains	618.9342	749.3002	852.8551	934.1481	975.3014	947.6799	910.9465	868.4456	821.5831	724.7087	623.1385	579.4331	(84)

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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	68.1664	68.3492	68.5294	69.3884	69.5515	70.3211	70.3211	70.4655	70.0227	69.5515	69.2223	68.8815	
alpha	5.5444	5.5566	5.5686	5.6259	5.6368	5.6881	5.6881	5.6977	5.6682	5.6368	5.6148	5.5921	
util living area	0.9964	0.9894	0.9700	0.9126	0.7873	0.5977	0.4361	0.4759	0.7180	0.9392	0.9910	0.9975	(86)
MIT	20.0088	20.2019	20.4518	20.7265	20.9102	20.9848	20.9978	20.9965	20.9590	20.7124	20.3028	19.9735	(87)
Th 2	20.0677	20.0700	20.0722	20.0827	20.0846	20.0937	20.0937	20.0954	20.0902	20.0846	20.0807	20.0765	(88)
util rest of house	0.9953	0.9861	0.9607	0.8868	0.7337	0.5196	0.3475	0.3844	0.6410	0.9152	0.9876	0.9967	(89)
MIT 2	18.7487	19.0305	19.3897	19.7747	20.0018	20.0842	20.0929	20.0940	20.0604	19.7660	19.1866	18.7037	(90)
Living area fraction									fLA = Living area / (4) =			0.3058	(91)
MIT	19.1340	19.3886	19.7145	20.0657	20.2795	20.3595	20.3696	20.3700	20.3352	20.0554	19.5279	19.0920	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1340	19.3886	19.7145	20.0657	20.2795	20.3595	20.3696	20.3700	20.3352	20.0554	19.5279	19.0920	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9937	0.9829	0.9562	0.8862	0.7459	0.5430	0.3747	0.4124	0.6628	0.9143	0.9848	0.9955	(94)
Useful gains	615.0299	736.4929	815.5216	827.8535	727.4292	514.6072	341.2955	358.1656	544.5672	662.6235	613.6705	576.7980	(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	1388.8008	1352.8412	1230.6254	1026.9594	787.2451	522.7042	342.1102	359.5547	568.2814	867.6103	1145.7866	1379.7583	(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	575.6856	414.1861	308.8372	143.3562	44.5030	0.0000	0.0000	0.0000	0.0000	152.5102	383.1236	597.4024	(98)
Space heating												2619.6043	(98)
Space heating per m2											(98) / (4) =	28.5049	(99)

8c. Space cooling requirement

Not applicable

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												2801.7159	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	575.6856	414.1861	308.8372	143.3562	44.5030	0.0000	0.0000	0.0000	0.0000	152.5102	383.1236	597.4024	(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)													
	615.7065	442.9798	330.3071	153.3222	47.5968	0.0000	0.0000	0.0000	0.0000	163.1125	409.7579	638.9331	(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													
	185.7501	163.2384	170.2998	151.0862	146.9180	129.6364	122.9417	137.0561	137.4880	156.7449	167.7236	180.7492	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.6335	87.1948	86.3832	84.6742	82.0555	79.8000	79.8000	79.8000	79.8000	84.7409	86.9501	87.7665	(217)
Fuel for water heating, kWh/month													
	211.9624	187.2112	197.1447	178.4325	179.0471	162.4516	154.0622	171.7495	172.2908	184.9695	192.8963	205.9434	(219)
Water heating fuel used												2198.1613	(219)
Annual totals kWh/year													
Space heating fuel - main system												2801.7159	(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)												389.2012	(232)
Total delivered energy for all uses												5464.0783	(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	2801.7159	0.2160	605.1706	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2198.1613	0.2160	474.8028	(264)
Space and water heating			1079.9735	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	389.2012	0.5190	201.9954	(268)
Total CO2, kg/m2/year			1320.8939	(272)
Emissions per m2 for space and water heating			11.7516	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.1980	(272b)
Emissions per m2 for pumps and fans			0.4236	(272c)
Target Carbon Dioxide Emission Rate (TER) = (11.7516 * 1.00) + 2.1980 + 0.4236, rounded to 2 d.p.			14.3700	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	A-4-04	**Issued on Date**	05/02/2020
Assessment Reference	ASHP - Be Lean	**Prop Type Ref**	2bed 3F
Property			

SAP Rating	83 B	**DER**	17.95	**TER**	19.24
Environmental	88 B	**% DER<TER**	6.70		
CO_2 Emissions (t/year)	0.85	**DFEE**	47.59	**TFEE**	53.54
General Requirements Compliance	Fail	**% DFEE<TFEE**	11.12		

Assessor Details	Miss Claudia Cioli, Claudia Cioli, Tel: 07481524839, clacioli@gmail.com	**Assessor ID**	R479-0001
Client			

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

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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England
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DWELLING AS DESIGNED

Top-floor flat, total floor area 57 m²

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

1a TER and DER
Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 19.24 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 17.95 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)53.5 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)47.6 kWh/m²/yrOK

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2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	OK
Openings	1.38 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction

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

---
4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage Nominal cylinder loss: 0.09 kWh/day
Permitted by DBSCG 0.32 OK
Primary pipework insulated: No primary pipework

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

Hot water controls: No cylinderstat

---
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: 94%
Minimum: 70% OK

---
9 Summertime temperature
Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing South: 7.61 m², No overhang
Windows facing South West: 8.40 m², No overhang
Air change rate: 0.50 ach
Blinds/curtains: None

---
10 Key features
Party wall U-value 0.00 W/m²K
Roof U-value 0.11 W/m²K
Air permeability 3.0 m³/m²h

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	57.0000 (1b)	x	2.5000 (2b)	=	142.5000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	57.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	142.5000	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							0 * 10 =	0.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.0000	
Infiltration rate		0.1500	(18)
Number of sides sheltered		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

If mechanical ventilation:	0.5000	(23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	79.9000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2774	0.2739	0.2705	0.2531	0.2497	0.2323	0.2323	0.2288	0.2393	0.2497	0.2566	0.2635	(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	
W03 (Uw = 1.40)			8.4000	1.3258	11.1364			(27)
W02 (Uw = 1.40)			7.6100	1.3258	10.0890			(27)
door			2.1000	1.2500	2.6250			(26a)
External Wall 1	49.0000	16.0100	32.9900	0.1500	4.9485	140.0000	4618.6000	(29a)
Corridor wall	3.5000	2.1000	1.4000	0.1409	0.1973	110.0000	154.0000	(29a)
roof	57.0000		57.0000	0.1100	6.2700	9.0000	513.0000	(30)
Total net area of external elements Aum(A, m2)			109.5000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.2662			(33)
Party Wall 1			22.2000	0.0000	0.0000	140.0000	3108.0000	(32)
Party Floor			57.0000			80.0000	4560.0000	(32d)
Internal Wall			84.5000			9.0000	760.5000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 13714.1000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	240.5982	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	15.3980	(36)
Total fabric heat loss	(33) + (36) = 50.6642	(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	13.0450	12.8819	12.7188	11.9032	11.7401	10.9245	10.9245	10.7614	11.2507	11.7401	12.0663	12.3926	(38)
Heat transfer coeff	63.7092	63.5461	63.3829	62.5674	62.4042	61.5886	61.5886	61.4255	61.9149	62.4042	62.7305	63.0567	(39)
Average = Sum(39)m / 12 =												62.5266	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1177	1.1148	1.1120	1.0977	1.0948	1.0805	1.0805	1.0776	1.0862	1.0948	1.1005	1.1063	(40)
HLP (average)												1.0970	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.8957 (42)
Average daily hot water use (litres/day)	83.3918 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	91.7310	88.3953	85.0596	81.7240	78.3883	75.0526	75.0526	78.3883	81.7240	85.0596	88.3953	91.7310	(44)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy conte	136.0344	118.9765	122.7731	107.0366	102.7042	88.6259	82.1249	94.2395	95.3650	111.1388	121.3167	131.7420	(45)
Energy content (annual)										Total = Sum(45)m =		1312.0776	(45)
Distribution loss (46)m = 0.15 x (45)m													
	20.4052	17.8465	18.4160	16.0555	15.4056	13.2939	12.3187	14.1359	14.3048	16.6708	18.1975	19.7613	(46)
Water storage loss:													
Store volume												2.0000	(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												3.9149	(52)
Temperature factor from Table 2b												1.0000	(53)
Enter (49) or (54) in (55)												0.0904	(55)
Total storage loss													
	2.8029	2.5316	2.8029	2.7124	2.8029	2.7124	2.8029	2.8029	2.7124	2.8029	2.7124	2.8029	(56)
If cylinder contains dedicated solar storage													
	2.8029	2.5316	2.8029	2.7124	2.8029	2.7124	2.8029	2.8029	2.7124	2.8029	2.7124	2.8029	(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													
	162.0996	142.5193	148.8384	132.2610	128.7694	113.8503	108.1902	120.3048	120.5895	137.2040	146.5411	157.8073	(62)
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													
	162.0996	142.5193	148.8384	132.2610	128.7694	113.8503	108.1902	120.3048	120.5895	137.2040	146.5411	157.8073	(64)
									Total per year (kWh/year) = Sum(64)m =			1618.9750	(64)
Heat gains from water heating, kWh/month													
	66.0836	58.3939	61.6743	55.7692	55.0013	49.6477	48.1587	52.1868	51.8884	57.8058	60.5173	64.6564	(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	94.7836	94.7836	94.7836	94.7836	94.7836	94.7836	94.7836	94.7836	94.7836	94.7836	94.7836	94.7836	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	14.7386	13.0907	10.6461	8.0598	6.0248	5.0864	5.4960	7.1439	9.5885	12.1749	14.2099	15.1483	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	165.3227	167.0382	162.7151	153.5118	141.8942	130.9753	123.6809	121.9653	126.2884	135.4918	147.1093	158.0282	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	32.4784	32.4784	32.4784	32.4784	32.4784	32.4784	32.4784	32.4784	32.4784	32.4784	32.4784	32.4784	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	(71)
Water heating gains (Table 5)													
	88.8221	86.8958	82.8955	77.4572	73.9265	68.9551	64.7295	70.1436	72.0673	77.6960	84.0519	86.9038	(72)
Total internal gains													
	320.3185	318.4598	307.6918	290.4639	273.2806	256.4519	245.3414	250.6879	259.3793	276.7977	296.8061	311.5153	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	8.4000	36.7938	0.3700	0.8900	0.7700	70.5309	(79)
South	7.6100	46.7521	0.5600	0.6800	0.7700	93.8892	(78)

Solar gains	164.4201	273.9065	360.2520	425.0528	458.8224	448.4905	435.2686	410.7613	382.6003	298.6319	195.7705	141.4886	(83)
Total gains	484.7385	592.3662	667.9438	715.5167	732.1030	704.9424	680.6100	661.4493	641.9796	575.4296	492.5766	453.0040	(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	59.7947	59.9482	60.1025	60.8859	61.0451	61.8535	61.8535	62.0177	61.5276	61.0451	60.7276	60.4134	
alpha	4.9863	4.9965	5.0068	5.0591	5.0697	5.1236	5.1236	5.1345	5.1018	5.0697	5.0485	5.0276	
util living area													
	0.9891	0.9715	0.9352	0.8576	0.7258	0.5462	0.3960	0.4241	0.6351	0.8811	0.9749	0.9920	(86)
MIT	20.0014	20.2348	20.4965	20.7540	20.9159	20.9843	20.9975	20.9964	20.9665	20.7564	20.3285	19.9556	(87)
Th 2	19.9864	19.9887	19.9911	20.0027	20.0051	20.0168	20.0168	20.0191	20.0121	20.0051	20.0004	19.9957	(88)
util rest of house													
	0.9859	0.9635	0.9178	0.8224	0.6670	0.4678	0.3087	0.3353	0.5558	0.8434	0.9664	0.9895	(89)
MIT 2	18.6815	19.0171	19.3847	19.7359	19.9298	20.0071	20.0159	20.0178	19.9888	19.7497	19.1639	18.6221	(90)
Living area fraction									fLA = Living area / (4) =			0.5053	(91)
MIT	19.3484	19.6324	19.9464	20.2503	20.4280	20.5009	20.5119	20.5123	20.4828	20.2584	19.7523	19.2958	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3484	19.6324	19.9464	20.2503	20.4280	20.5009	20.5119	20.5123	20.4828	20.2584	19.7523	19.2958	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9832	0.9601	0.9169	0.8318	0.6930	0.5070	0.3529	0.3802	0.5946	0.8540	0.9639	0.9873	(94)
Useful gains	476.6084	568.7483	612.4687	595.1692	507.3281	357.4146	240.1636	251.4801	381.7093	491.4021	474.7701	447.2606	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	958.7200	936.1845	852.2754	710.1574	544.6657	363.4265	240.9259	252.5972	395.1886	602.7222	793.6857	951.8938	(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													
	358.6910	246.9171	178.4162	82.7915	27.7791	0.0000	0.0000	0.0000	0.0000	82.8222	229.6192	375.4471	(98)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Space heating		1582.4834 (98)
Space heating per m2	(98) / (4) =	27.7629 (99)

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1000 (306)
Space heating:	
Annual space heating requirement	1582.4834 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.10	1740.7318 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1618.9750 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.10	1780.8725 (310a)
Electricity used for heat distribution	35.2160 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.2500, SFP = 0.6625)	
mechanical ventilation fans (SFP = 0.6625)	115.1756 (330a)
Total electricity for the above, kWh/year	115.1756 (331)
Electricity for lighting (calculated in Appendix L)	260.2889 (332)
Total delivered energy for all uses	3897.0688 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Boilers			93.9000	(367a)
Space heating from Boilers	3750.3773	0.2160	810.0815	(367)
Electrical energy for heat distribution	35.2160	0.5190	18.2771	(372)
Total CO2 associated with community systems			828.3586	(373)
(negative value allowed since DFEE <= TFEE)				
Space and water heating			828.3586	(376)
Pumps and fans	115.1756	0.5190	59.7761	(378)
Energy for lighting	260.2889	0.5190	135.0899	(379)
Total CO2, kg/year			1023.2247	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			17.9500	(384)

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

DER		17.9500	ZC1
Total Floor Area	TFA	57.0000	
Assumed number of occupants	N	1.8957	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.1871	ZC2
CO2 emissions from cooking, equation (L16)		2.8859	ZC3
Total CO2 emissions		38.0230	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		38.0230	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	57.0000 (1b)	x	2.5000 (2b)	=	142.5000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	57.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	142.5000	(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)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1404	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3904	(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) =	0.3611	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4604	0.4513	0.4423	0.3972	0.3882	0.3430	0.3430	0.3340	0.3611	0.3882	0.4062	0.4243	(22b)
Effective ac	0.6060	0.6019	0.5978	0.5789	0.5753	0.5588	0.5588	0.5558	0.5652	0.5753	0.5825	0.5900	(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 Semi-glazed door			2.1000	1.2000	2.5200			(26a)
TER Opening Type (Uw = 1.40)			12.1500	1.3258	16.1080			(27)
External Wall 1	49.0000	12.1500	36.8500	0.1800	6.6330			(29a)
Corridor wall	3.5000	2.1000	1.4000	0.1800	0.2520			(29a)
roof	57.0000		57.0000	0.1300	7.4100			(30)
Total net area of external elements Aum(A, m2)			109.5000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.9230			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.7230	(36)
Total fabric heat loss					(33) + (36) =		46.6460	(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	28.4958	28.3022	28.1126	27.2217	27.0550	26.2791	26.2791	26.1354	26.5779	27.0550	27.3922	27.7447	(38)
Heat transfer coeff	75.1417	74.9482	74.7585	73.8676	73.7010	72.9250	72.9250	72.7813	73.2239	73.7010	74.0382	74.3907	(39)
Average = Sum(39)m / 12 =												73.8668	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3183	1.3149	1.3116	1.2959	1.2930	1.2794	1.2794	1.2769	1.2846	1.2930	1.2989	1.3051	(40)
HLP (average)												1.2959	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.8957	(42)
Average daily hot water use (litres/day)	79.2222	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	87.1444	83.9755	80.8066	77.6378	74.4689	71.3000	71.3000	74.4689	77.6378	80.8066	83.9755	87.1444	(44)
Energy conte	129.2327	113.0277	116.6345	101.6848	97.5689	84.1946	78.0187	89.5275	90.5968	105.5818	115.2508	125.1549	(45)
Energy content (annual)										Total = Sum(45)m =		1246.4737	(45)
Distribution loss (46)m = 0.15 x (45)m	19.3849	16.9542	17.4952	15.2527	14.6353	12.6292	11.7028	13.4291	13.5895	15.8373	17.2876	18.7732	(46)
Water storage loss:													
Store volume												2.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.2388	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.1290	(55)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss													
	3.9977	3.6109	3.9977	3.8688	3.9977	3.8688	3.9977	3.9977	3.8688	3.9977	3.8688	3.9977	(56)
If cylinder contains dedicated solar storage													
	3.9977	3.6109	3.9977	3.8688	3.9977	3.8688	3.9977	3.9977	3.8688	3.9977	3.8688	3.9977	(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													
	156.4928	137.6498	143.8946	128.0655	124.8291	110.5754	105.2788	116.7877	116.9776	132.8420	141.6316	152.4151	(62)
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													
	156.4928	137.6498	143.8946	128.0655	124.8291	110.5754	105.2788	116.7877	116.9776	132.8420	141.6316	152.4151	(64)
									Total per year (kWh/year) = Sum(64)m =			1567.4399	(64)
Heat gains from water heating, kWh/month													
	64.7780	57.2794	60.5891	54.9148	54.2498	49.0993	47.7493	51.5760	51.2281	56.9141	59.4255	63.4221	(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	94.7836	94.7836	94.7836	94.7836	94.7836	94.7836	94.7836	94.7836	94.7836	94.7836	94.7836	94.7836	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	14.7649	13.1140	10.6650	8.0741	6.0355	5.0954	5.5058	7.1566	9.6056	12.1965	14.2352	15.1752	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	165.3227	167.0382	162.7151	153.5118	141.8942	130.9753	123.6809	121.9653	126.2884	135.4918	147.1093	158.0282	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	32.4784	32.4784	32.4784	32.4784	32.4784	32.4784	32.4784	32.4784	32.4784	32.4784	32.4784	32.4784	(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)													
	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	(71)
Water heating gains (Table 5)													
	87.0672	85.2371	81.4369	76.2706	72.9164	68.1935	64.1792	69.3226	71.1501	76.4974	82.5355	85.2448	(72)
Total internal gains													
	321.5898	319.8244	309.2522	292.2915	275.2812	258.6994	247.8009	252.8797	261.4792	278.6208	298.3150	312.8833	(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	5.7800	46.7521	0.6300	0.7000	0.7700	82.5849	(78)
Southwest	6.3700	36.7938	0.6300	0.7000	0.7700	71.6286	(79)

Solar gains	154.2134	257.2627	339.2273	401.5688	434.5979	425.2856	412.5504	388.5129	360.7351	280.7297	183.6857	132.6601	(83)
Total gains	475.8032	577.0871	648.4795	693.8603	709.8791	683.9850	660.3513	641.3925	622.2143	559.3505	482.0007	445.5433	(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	52.6782	52.8143	52.9483	53.5868	53.7080	54.2795	54.2795	54.3867	54.0579	53.7080	53.4634	53.2101	
alpha	4.5119	4.5210	4.5299	4.5725	4.5805	4.6186	4.6186	4.6258	4.6039	4.5805	4.5642	4.5473	
util living area													
	0.9922	0.9811	0.9584	0.9070	0.8061	0.6404	0.4768	0.5093	0.7270	0.9229	0.9831	0.9941	(86)
MIT	19.7486	19.9755	20.2597	20.5756	20.8183	20.9538	20.9904	20.9869	20.9150	20.5981	20.1092	19.7071	(87)
Th 2	19.8265	19.8292	19.8318	19.8440	19.8463	19.8570	19.8570	19.8590	19.8529	19.8463	19.8417	19.8368	(88)
util rest of house													
	0.9896	0.9751	0.9450	0.8771	0.7460	0.5428	0.3576	0.3893	0.6361	0.8914	0.9766	0.9921	(89)
MIT 2	18.1972	18.5261	18.9320	19.3743	19.6798	19.8285	19.8538	19.8542	19.7930	19.4162	18.7312	18.1442	(90)
Living area fraction										fLA = Living area / (4) =		0.5053	(91)
MIT	18.9811	19.2584	19.6029	19.9812	20.2550	20.3971	20.4281	20.4265	20.3599	20.0134	19.4275	18.9339	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9811	19.2584	19.6029	19.9812	20.2550	20.3971	20.4281	20.4265	20.3599	20.0134	19.4275	18.9339	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9871	0.9714	0.9419	0.8811	0.7690	0.5907	0.4181	0.4502	0.6787	0.8967	0.9736	0.9900	(94)
Useful gains	469.6550	560.5607	610.7945	611.3713	545.8978	403.9982	276.1165	288.7548	422.3082	501.5682	469.2967	441.1021	(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													
	1103.1613	1076.1363	979.5502	818.5454	630.5148	422.7505	279.1622	293.0560	458.3719	693.7755	912.7043	1096.0637	(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													
	471.3286	346.4668	274.3542	149.1654	62.9550	0.0000	0.0000	0.0000	0.0000	143.0022	319.2534	487.2914	(98)
Space heating												2253.8172	(98)
Space heating per m2											(98) / (4) =	39.5407	(99)

8c. Space cooling requirement

Not applicable

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												2410.4997	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	471.3286	346.4668	274.3542	149.1654	62.9550	0.0000	0.0000	0.0000	0.0000	143.0022	319.2534	487.2914	(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)													
	504.0948	370.5528	293.4270	159.5352	67.3316	0.0000	0.0000	0.0000	0.0000	152.9435	341.4475	521.1673	(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													
	156.4928	137.6498	143.8946	128.0655	124.8291	110.5754	105.2788	116.7877	116.9776	132.8420	141.6316	152.4151	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.5731	87.1764	86.5093	85.2214	83.0936	79.8000	79.8000	79.8000	79.8000	85.0106	86.9185	87.6983	(217)
Fuel for water heating, kWh/month													
	178.6996	157.8979	166.3343	150.2740	150.2270	138.5656	131.9283	146.3505	146.5884	156.2652	162.9475	173.7948	(219)
Water heating fuel used												1859.8733	(219)
Annual totals kWh/year													
Space heating fuel - main system												2410.4997	(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)												260.7522	(232)
Total delivered energy for all uses												4606.1251	(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	2410.4997	0.2160	520.6679	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1859.8733	0.2160	401.7326	(264)
Space and water heating			922.4006	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	260.7522	0.5190	135.3304	(268)
Total CO2, kg/m2/year			1096.6559	(272)
Emissions per m2 for space and water heating			16.1825	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.3742	(272b)
Emissions per m2 for pumps and fans			0.6829	(272c)
Target Carbon Dioxide Emission Rate (TER) = (16.1825 * 1.00) + 2.3742 + 0.6829, rounded to 2 d.p.			19.2400	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	D-0-01	**Issued on Date**	05/02/2020
Assessment Reference	ASHP - Be Lean	**Prop Type Ref**	2bed 3F
Property			

SAP Rating	81 B	**DER**	22.73	**TER**	25.52
Environmental	87 B	**% DER<TER**	10.93		
CO_2 Emissions (t/year)	0.80	**DFEE**	61.72	**TFEE**	63.73
General Requirements Compliance	Fail	**% DFEE<TFEE**	3.16		

Assessor Details	Miss Claudia Cioli, Claudia Cioli, Tel: 07481524839, clacioli@gmail.com	**Assessor ID**	R479-0001
Client			

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

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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England
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DWELLING AS DESIGNED

Ground-floor flat, total floor area 43 m²

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

1a TER and DER
Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 25.52 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 22.73 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)63.7 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)61.7 kWh/m²/yrOK

---
2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.11 (max. 0.25)	0.11 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction

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

---
4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage Measured cylinder loss: 0.74 kWh/day
Permitted by DBSCG 0.32 Fail
Primary pipework insulated: No primary pipework

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

Hot water controls: No cylinderstat

---
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: 94%
Minimum: 70% OK

---
9 Summertime temperature
Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing West: 6.66 m², No overhang
Air change rate: 0.50 ach
Blinds/curtains: None

---
10 Key features
Party wall U-value 0.00 W/m²K
Floor U-value 0.11 W/m²K
Air permeability 3.0 m³/m²h

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	43.4000 (1b)	x	2.8000 (2b)	=	121.5200	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.4000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	121.5200	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							0 * 10 =	0.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.0000	
Infiltration rate		0.1500	(18)
Number of sides sheltered		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) =	79.9000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2631	0.2599	0.2567	0.2408	0.2376	0.2216	0.2216	0.2184	0.2280	0.2376	0.2439	0.2503	(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	
W01 (Uw = 1.40)			6.6600	1.3258	8.8295			(27)
door			2.1000	1.4000	2.9400			(26a)
Heat Loss Floor 1			43.4000	0.1100	4.7740	110.0000	4774.0000	(28a)
External Wall 1	37.5000	8.7600	28.7400	0.1800	5.1732	140.0000	4023.6000	(29a)
Total net area of external elements Aum(A, m2)			80.9000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.7167			(33)
Party Wall 1			37.5000	0.0000	0.0000	140.0000	5250.0000	(32)
Party Ceilings			43.4000			80.0000	3472.0000	(32b)
Internal Wall			58.2000			9.0000	523.8000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	18043.4000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		415.7465 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)		12.2778 (36)
Total fabric heat loss	(33) + (36) =	33.9945 (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	10.5492	10.4214	10.2936	9.6545	9.5266	8.8875	8.8875	8.7597	9.1432	9.5266	9.7823	10.0379	(38)
Heat transfer coeff	44.5438	44.4159	44.2881	43.6490	43.5212	42.8821	42.8821	42.7542	43.1377	43.5212	43.7768	44.0325	(39)
Average = Sum(39)m / 12 =												43.6170	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0264	1.0234	1.0205	1.0057	1.0028	0.9881	0.9881	0.9851	0.9940	1.0028	1.0087	1.0146	(40)
HLP (average)												1.0050	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.4993 (42)
Average daily hot water use (litres/day)	73.4837 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	80.8321	77.8927	74.9534	72.0140	69.0747	66.1353	66.1353	69.0747	72.0140	74.9534	77.8927	80.8321	(44)
Energy conte	119.8716	104.8405	108.1860	94.3192	90.5015	78.0959	72.3673	83.0426	84.0344	97.9339	106.9026	116.0893	(45)
Energy content (annual)										Total = Sum(45)m =		1156.1846	(45)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m

	17.9807	15.7261	16.2279	14.1479	13.5752	11.7144	10.8551	12.4564	12.6052	14.6901	16.0354	17.4134 (46)

Water storage loss:

Store volume 2.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 0.7400 (48)

Temperature factor from Table 2b 1.0000 (49)

Enter (49) or (54) in (55) 0.7400 (55)

Total storage loss

	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400 (56)

If cylinder contains dedicated solar storage

	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400 (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

	166.0740	146.5717	154.3884	139.0312	136.7039	122.8079	118.5697	129.2450	128.7464	144.1363	151.6146	162.2917 (62)
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

	166.0740	146.5717	154.3884	139.0312	136.7039	122.8079	118.5697	129.2450	128.7464	144.1363	151.6146	162.2917 (64)

Total per year (kWh/year) = Sum(64)m = 1700.1806 (64)

Heat gains from water heating, kWh/month

	76.8192	68.2444	72.9338	67.1307	67.0537	61.7365	61.0241	64.5736	63.7110	69.5250	71.3147	75.5616 (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	74.9674	74.9674	74.9674	74.9674	74.9674	74.9674	74.9674	74.9674	74.9674	74.9674	74.9674	74.9674	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	12.4438	11.0525	8.9885	6.8049	5.0867	4.2944	4.6403	6.0316	8.0956	10.2792	11.9974	12.7897 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	130.1693	131.5200	128.1162	120.8698	111.7225	103.1254	97.3820	96.0312	99.4351	106.6815	115.8287	124.4259 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	30.4967	30.4967	30.4967	30.4967	30.4967	30.4967	30.4967	30.4967	30.4967	30.4967	30.4967	30.4967 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

	-59.9739	-59.9739	-59.9739	-59.9739	-59.9739	-59.9739	-59.9739	-59.9739	-59.9739	-59.9739	-59.9739	-59.9739 (71)

Water heating gains (Table 5)

	103.2517	101.5542	98.0292	93.2371	90.1259	85.7451	82.0216	86.7924	88.4875	93.4475	99.0482	101.5613 (72)

Total internal gains

	291.3550	289.6169	280.6241	266.4020	252.4254	238.6552	229.5341	234.3455	241.5085	255.8985	272.3645	284.2671 (73)

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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	6.6600	19.6403	0.3700	0.6400	0.7700	21.4653	(80)

Solar gains	21.4653	41.9906	69.1526	100.8549	123.6015	126.5281	120.4599	103.4733	80.4273	49.8254	26.7647	17.6520	(83)
Total gains	312.8203	331.6076	349.7767	367.2569	376.0269	365.1833	349.9940	337.8188	321.9358	305.7239	299.1292	301.9191	(84)

---

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	112.5198	112.8436	113.1693	114.8263	115.1636	116.8800	116.8800	117.2294	116.1873	115.1636	114.4911	113.8263	
alpha	8.5013	8.5229	8.5446	8.6551	8.6776	8.7920	8.7920	8.8153	8.7458	8.6776	8.6327	8.5884	
util living area	0.9996	0.9992	0.9975	0.9865	0.9265	0.7354	0.5380	0.5801	0.8588	0.9890	0.9989	0.9997	(86)
MIT	20.3786	20.4468	20.5770	20.7604	20.9185	20.9915	20.9994	20.9990	20.9694	20.7828	20.5527	20.3680	(87)
Th 2	20.0614	20.0639	20.0663	20.0786	20.0810	20.0933	20.0933	20.0958	20.0884	20.0810	20.0761	20.0712	(88)
util rest of house	0.9994	0.9988	0.9959	0.9774	0.8825	0.6401	0.4279	0.4674	0.7762	0.9797	0.9981	0.9996	(89)
MIT 2	19.2394	19.3411	19.5330	19.8056	20.0113	20.0895	20.0932	20.0955	20.0705	19.8416	19.5061	19.2319	(90)

Living area fraction fLA = Living area / (4) = 0.8249 (91)

MIT	20.1791	20.2532	20.3942	20.5932	20.7597	20.8335	20.8407	20.8408	20.8120	20.6180	20.3694	20.1691	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1791	20.2532	20.3942	20.5932	20.7597	20.8335	20.8407	20.8408	20.8120	20.6180	20.3694	20.1691	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9995	0.9989	0.9965	0.9830	0.9166	0.7187	0.5188	0.5605	0.8438	0.9858	0.9984	0.9996	(94)
Useful gains	312.6505	331.2418	348.5617	361.0314	344.6698	262.4665	181.5752	189.3427	271.6537	301.3862	298.6571	301.7980	(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	707.3168	681.9252	615.3484	510.3958	394.2875	267.3060	181.8520	189.8620	289.5394	435.9952	580.8943	703.1580	(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	293.6317	235.6592	198.4893	107.5424	36.9155	0.0000	0.0000	0.0000	0.0000	100.1491	203.2108	298.6119	(98)

Space heating 1474.2098 (98)

Space heating per m2 (98) / (4) = 33.9680 (99)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Boilers	1.0000	(303a)
Fraction of total space heat from community Boilers	1.0000	(304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.1000	(306)
Space heating:		
Annual space heating requirement	1474.2098	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.10	1621.6308	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	1700.1806	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.10	1870.1987	(310a)
Electricity used for heat distribution	34.9183	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.2500, SFP = 0.6625)		
mechanical ventilation fans (SFP = 0.6625)	98.2185	(330a)
Total electricity for the above, kWh/year	98.2185	(331)
Electricity for lighting (calculated in Appendix L)	219.7622	(332)
Total delivered energy for all uses	3809.8102	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Boilers			93.9000	(367a)
Space heating from Boilers	3718.6682	0.2160	803.2323	(367)
Electrical energy for heat distribution	34.9183	0.5190	18.1226	(372)
Total CO2 associated with community systems			821.3549	(373)
(negative value allowed since DFEE <= TFEE)				
Space and water heating			821.3549	(376)
Pumps and fans	98.2185	0.5190	50.9754	(378)
Energy for lighting	219.7622	0.5190	114.0566	(379)
Total CO2, kg/year			986.3869	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			22.7300	(384)

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

DER		22.7300	ZC1
Total Floor Area	TFA	43.4000	
Assumed number of occupants	N	1.4993	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.7732	ZC2
CO2 emissions from cooking, equation (L16)		3.5711	ZC3
Total CO2 emissions		44.0742	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		44.0742	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	43.4000 (1b)	x	2.8000 (2b)	=	121.5200	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.4000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	121.5200	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							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) =	0.1646	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.4146	(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) =	0.3524	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4493	0.4405	0.4317	0.3876	0.3788	0.3348	0.3348	0.3260	0.3524	0.3788	0.3964	0.4141	(22b)
Effective ac	0.6009	0.5970	0.5932	0.5751	0.5718	0.5560	0.5560	0.5531	0.5621	0.5718	0.5786	0.5857	(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 Semi-glazed door			2.1000	1.2000	2.5200			(26a)
TER Opening Type (Uw = 1.40)			6.6600	1.3258	8.8295			(27)
Heat Loss Floor 1			43.4000	0.1300	5.6420			(28a)
External Wall 1	37.5000	8.7600	28.7400	0.1800	5.1732			(29a)
Total net area of external elements Aum(A, m2)			80.9000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		22.1647			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.1950	(36)
Total fabric heat loss					(33) + (36) =		32.3597	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	24.0985	23.9413	23.7873	23.0636	22.9282	22.2980	22.2980	22.1813	22.5407	22.9282	23.2021	23.4885	(38)
Heat transfer coeff	56.4583	56.3011	56.1470	55.4234	55.2880	54.6577	54.6577	54.5410	54.9005	55.2880	55.5619	55.8482	(39)
Average = Sum(39)m / 12 =												55.4227	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3009	1.2973	1.2937	1.2770	1.2739	1.2594	1.2594	1.2567	1.2650	1.2739	1.2802	1.2868	(40)
HLP (average)												1.2770	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.4993	(42)
Average daily hot water use (litres/day)	69.8095	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	76.7905	73.9981	71.2057	68.4133	65.6209	62.8286	62.8286	65.6209	68.4133	71.2057	73.9981	76.7905	(44)
Energy conte	113.8780	99.5985	102.7767	89.6032	85.9764	74.1911	68.7490	78.8904	79.8326	93.0372	101.5574	110.2848	(45)
Energy content (annual)										Total = Sum(45)m =		1098.3754	(45)
Distribution loss (46)m = 0.15 x (45)m	17.0817	14.9398	15.4165	13.4405	12.8965	11.1287	10.3123	11.8336	11.9749	13.9556	15.2336	16.5427	(46)
Water storage loss:													
Store volume												2.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.2388	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.1290	(55)
Total storage loss													

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

	3.9977	3.6109	3.9977	3.8688	3.9977	3.8688	3.9977	3.9977	3.8688	3.9977	3.8688	3.9977	(56)
If cylinder contains dedicated solar storage													
	3.9977	3.6109	3.9977	3.8688	3.9977	3.8688	3.9977	3.9977	3.8688	3.9977	3.8688	3.9977	(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													
	141.1382	124.2205	130.0368	115.9840	113.2365	100.5719	96.0091	106.1506	106.2134	120.2974	127.9382	137.5449	(62)
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													
	141.1382	124.2205	130.0368	115.9840	113.2365	100.5719	96.0091	106.1506	106.2134	120.2974	127.9382	137.5449	(64)
								Total per year (kWh/year) = Sum(64)m =				1419.3416	(64)
Heat gains from water heating, kWh/month													
	59.6726	52.8141	55.9814	50.8977	50.3953	45.7732	44.6671	48.0392	47.6490	52.7430	54.8725	58.4778	(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	74.9674	74.9674	74.9674	74.9674	74.9674	74.9674	74.9674	74.9674	74.9674	74.9674	74.9674	74.9674	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	12.2094	10.8442	8.8191	6.6767	4.9909	4.2135	4.5528	5.9180	7.9431	10.0856	11.7713	12.5487	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	130.1693	131.5200	128.1162	120.8698	111.7225	103.1254	97.3820	96.0312	99.4351	106.6815	115.8287	124.4259	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	30.4967	30.4967	30.4967	30.4967	30.4967	30.4967	30.4967	30.4967	30.4967	30.4967	30.4967	30.4967	(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)													
	-59.9739	-59.9739	-59.9739	-59.9739	-59.9739	-59.9739	-59.9739	-59.9739	-59.9739	-59.9739	-59.9739	-59.9739	(71)
Water heating gains (Table 5)													
	80.2051	78.5925	75.2438	70.6912	67.7356	63.5738	60.0365	64.5688	66.1791	70.8911	76.2118	78.5992	(72)
Total internal gains													
	271.0739	269.4470	260.6693	246.7279	232.9392	219.4030	210.4615	215.0082	222.0475	236.1484	252.3020	264.0640	(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	6.6600	19.6403	0.6300	0.7000	0.7700	39.9755	(80)
Solar gains	39.9755	78.2005	128.7850	187.8253	230.1869	235.6373	224.3363	192.7016	149.7823	92.7914	49.8447	32.8739	(83)
Total gains	311.0494	347.6474	389.4543	434.5532	463.1261	455.0402	434.7978	407.7098	371.8298	328.9398	302.1467	296.9378	(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	53.3826	53.5316	53.6785	54.3794	54.5125	55.1411	55.1411	55.2591	54.8973	54.5125	54.2438	53.9657	
alpha	4.5588	4.5688	4.5786	4.6253	4.6342	4.6761	4.6761	4.6839	4.6598	4.6342	4.6163	4.5977	
util living area	0.9957	0.9922	0.9819	0.9482	0.8626	0.7017	0.5371	0.5894	0.8309	0.9664	0.9920	0.9965	(86)
MIT	19.6666	19.8167	20.0896	20.4531	20.7573	20.9353	20.9852	20.9775	20.8519	20.4559	20.0010	19.6438	(87)
Th 2	20.3496	20.3514	20.3531	20.3615	20.3630	20.3703	20.3703	20.3716	20.3675	20.3630	20.3599	20.3566	(88)
util rest of house	0.9950	0.9909	0.9785	0.9381	0.8361	0.6493	0.4663	0.5181	0.7900	0.9581	0.9903	0.9959	(89)
MIT 2	19.0930	19.2440	19.5165	19.8802	20.1688	20.3280	20.3632	20.3602	20.2608	19.8877	19.4350	19.0759	(90)
Living area fraction										fLA = Living area / (4) =		0.8249	(91)
MIT	19.5661	19.7164	19.9892	20.3527	20.6543	20.8289	20.8763	20.8694	20.7484	20.3564	19.9019	19.5444	(92)
Temperature adjustment												0.6000	
adjusted MIT	20.1661	20.3164	20.5892	20.9527	21.2543	21.4289	21.4763	21.4694	21.3484	20.9564	20.5019	20.1444	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9947	0.9908	0.9798	0.9475	0.8720	0.7338	0.5873	0.6384	0.8501	0.9659	0.9907	0.9957	(94)
Useful gains	309.4102	344.4402	381.5951	411.7367	403.8454	333.9136	255.3712	260.2768	316.0745	317.7187	299.3373	295.6657	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	895.7736	867.9593	791.0680	668.0040	528.2371	373.2542	266.5255	276.4903	397.9407	572.5845	744.6353	890.4638	(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	436.2544	351.8048	304.6478	184.5125	92.5474	0.0000	0.0000	0.0000	0.0000	189.6202	320.6146	442.5298	(98)
Space heating												2322.5314	(98)
Space heating per m2											(98) / (4) =	53.5145	(99)

8c. Space cooling requirement

Not applicable

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 %)												88.5000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												2624.3293	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	436.2544	351.8048	304.6478	184.5125	92.5474	0.0000	0.0000	0.0000	0.0000	189.6202	320.6146	442.5298	(98)
Space heating efficiency (main heating system 1)													
	88.5000	88.5000	88.5000	88.5000	88.5000	0.0000	0.0000	0.0000	0.0000	88.5000	88.5000	88.5000	(210)
Space heating fuel (main heating system)													
	492.9428	397.5196	344.2348	208.4887	104.5734	0.0000	0.0000	0.0000	0.0000	214.2601	362.2764	500.0336	(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													
	141.1382	124.2205	130.0368	115.9840	113.2365	100.5719	96.0091	106.1506	106.2134	120.2974	127.9382	137.5449	(64)
Efficiency of water heater												74.8000	(216)
(217)m	82.6113	82.4232	81.9913	81.0263	79.2610	74.8000	74.8000	74.8000	74.8000	81.0023	82.1483	82.6951	(217)
Fuel for water heating, kWh/month													
	170.8460	150.7106	158.5983	143.1436	142.8654	134.4544	128.3544	141.9125	141.9966	148.5111	155.7406	166.3279	(219)
Water heating fuel used												1783.4613	(219)
Annual totals kWh/year													
Space heating fuel - main system												2624.3293	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												39.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												84.0000	(231)
Electricity for lighting (calculated in Appendix L)												215.6211	(232)
Total delivered energy for all uses												4707.4117	(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	2624.3293	0.2160	566.8551	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1783.4613	0.2160	385.2276	(264)
Space and water heating			952.0828	(265)
Pumps and fans	84.0000	0.5190	43.5960	(267)
Energy for lighting	215.6211	0.5190	111.9073	(268)
Total CO2, kg/m2/year			1107.5861	(272)
Emissions per m2 for space and water heating			21.9374	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.5785	(272b)
Emissions per m2 for pumps and fans			1.0045	(272c)
Target Carbon Dioxide Emission Rate (TER) = (21.9374 * 1.00) + 2.5785 + 1.0045, rounded to 2 d.p.			25.5200	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	D-1/2-01	**Issued on Date**	05/02/2020
Assessment Reference	ASHP - Be lean	**Prop Type Ref**	2bed 3F
Property			

SAP Rating	82 B	**DER**	19.62	**TER**	19.24
Environmental	88 B	**% DER<TER**	-1.98		
CO_2 Emissions (t/year)	0.81	**DFEE**	50.37	**TFEE**	50.38
General Requirements Compliance	Fail	**% DFEE<TFEE**	0.02		

Assessor Details	Miss Claudia Cioli, Claudia Cioli, Tel: 07481524839, clacioli@gmail.com	**Assessor ID**	R479-0001
Client			

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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England
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DWELLING AS DESIGNED

Mid-floor flat, total floor area 50 m²

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

1a TER and DER
Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 19.24 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 19.62 kgCO□/m²Fail
Excess emissions =0.38 kgCO□/m² (2.0%)

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)50.4 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)50.4 kWh/m²/yrOK
---
2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction
---
3 Air permeability
Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK
---
4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None
---
5 Cylinder insulation
Hot water storage Measured cylinder loss: 0.74 kWh/day
Permitted by DBSCG 0.32 Fail
Primary pipework insulated: No primary pipework
---
6 Controls
Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinderstat

---
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: 94%
Minimum: 70% OK
---
9 Summertime temperature
Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing East: 7.32 m², Overhang width less than twice window, ratio 1.00
Windows facing West: 6.66 m², No overhang
Air change rate: 0.50 ach
Blinds/curtains: None
---
10 Key features
Party wall U-value 0.00 W/m²K
Air permeability 3.0 m³/m²h

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	49.5000 (1b)	x	2.5500 (2b)	=	126.2250	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.5000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	126.2250	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							0 * 10 =	0.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.0000	
Infiltration rate		0.1500	(18)
Number of sides sheltered		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

If mechanical ventilation:	0.5000	(23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	79.9000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2774	0.2739	0.2705	0.2531	0.2497	0.2323	0.2323	0.2288	0.2393	0.2497	0.2566	0.2635	(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	
W29 (Uw = 1.40)			7.3200	1.3258	9.7045			(27)
W02 (Uw = 1.40)			6.6600	1.3258	8.8295			(27)
door			2.1000	1.4000	2.9400			(26a)
External Wall 1	55.6000	13.9800	41.6200	0.1800	7.4916	140.0000	5826.8000	(29a)
stair wall	22.2000	2.1000	20.1000	0.1800	3.6180	140.0000	2814.0000	(29a)
Total net area of external elements Aum(A, m2)			77.8000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.5837			(33)
Party Wall 1			5.1000	0.0000	0.0000	140.0000	714.0000	(32)
Party Floor 1			49.5000			80.0000	3960.0000	(32d)
Party Ceilings			49.5000			80.0000	3960.0000	(32b)
Internal Wall			64.4000			9.0000	579.6000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 17854.4000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	360.6949	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	7.5945	(36)
Total fabric heat loss	(33) + (36) = 40.1782	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	11.5551	11.4107	11.2662	10.5437	10.3992	9.6768	9.6768	9.5323	9.9658	10.3992	10.6882	10.9772	(38)
Heat transfer coeff	51.7333	51.5889	51.4444	50.7219	50.5774	49.8550	49.8550	49.7105	50.1440	50.5774	50.8664	51.1554	(39)
Average = Sum(39)m / 12 =												50.6858	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0451	1.0422	1.0393	1.0247	1.0218	1.0072	1.0072	1.0043	1.0130	1.0218	1.0276	1.0334	(40)
HLP (average)												1.0240	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.6754 (42)
Average daily hot water use (litres/day)	77.8847 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	85.6732	82.5578	79.4424	76.3270	73.2117	70.0963	70.0963	73.2117	76.3270	79.4424	82.5578	85.6732	(44)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy conte	127.0509	111.1195	114.6654	99.9681	95.9218	82.7732	76.7015	88.0161	89.0673	103.7994	113.3051	123.0420	(45)
Energy content (annual)										Total = Sum(45)m =		1225.4303	(45)
Distribution loss (46)m = 0.15 x (45)m													
	19.0576	16.6679	17.1998	14.9952	14.3883	12.4160	11.5052	13.2024	13.3601	15.5699	16.9958	18.4563	(46)
Water storage loss:													
Store volume												2.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.7400	(48)
Temperature factor from Table 2b												1.0000	(49)
Enter (49) or (54) in (55)												0.7400	(55)
Total storage loss													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(56)
If cylinder contains dedicated solar storage													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(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													
	173.2533	152.8507	160.8678	144.6801	142.1242	127.4852	122.9039	134.2185	133.7793	150.0018	158.0171	169.2444	(62)
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													
	173.2533	152.8507	160.8678	144.6801	142.1242	127.4852	122.9039	134.2185	133.7793	150.0018	158.0171	169.2444	(64)
									Total per year (kWh/year) = Sum(64)m =			1769.4263	(64)
Heat gains from water heating, kWh/month													
	79.2063	70.3322	75.0882	69.0090	68.8559	63.2917	62.4652	66.2273	65.3845	71.4752	73.4436	77.8734	(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	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	13.0102	11.5556	9.3976	7.1146	5.3183	4.4899	4.8515	6.3062	8.4641	10.7471	12.5435	13.3718	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	145.9354	147.4497	143.6336	135.5095	125.2544	115.6159	109.1769	107.6625	111.4787	119.6027	129.8579	139.4963	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	(71)
Water heating gains (Table 5)													
	106.4601	104.6610	100.9250	95.8458	92.5483	87.9051	83.9586	89.0152	90.8118	96.0688	102.0049	104.6685	(72)
Total internal gains													
	313.5366	311.7972	302.0870	286.6008	271.2517	256.1418	246.1178	251.1147	258.8854	274.5495	292.5372	305.6675	(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	7.3200	19.6403	0.3700	0.8900	0.7700	32.8083	(76)
West	6.6600	19.6403	0.5600	0.6800	0.7700	34.5185	(80)

Solar gains	67.3268	131.7054	216.9001	316.3358	387.6814	396.8609	377.8278	324.5485	252.2638	156.2796	83.9486	55.3662	(83)
Total gains	380.8634	443.5026	518.9871	602.9366	658.9331	653.0027	623.9456	575.6632	511.1491	430.8291	376.4857	361.0338	(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	95.8677	96.1362	96.4062	97.7793	98.0587	99.4796	99.4796	99.7688	98.9063	98.0587	97.5016	96.9508	
alpha	7.3912	7.4091	7.4271	7.5186	7.5372	7.6320	7.6320	7.6513	7.5938	7.5372	7.5001	7.4634	
util living area													
	0.9987	0.9955	0.9784	0.8903	0.6968	0.4876	0.3515	0.3970	0.6652	0.9509	0.9958	0.9991	(86)
MIT	20.3106	20.4451	20.6602	20.8900	20.9839	20.9990	20.9999	20.9998	20.9914	20.8336	20.5254	20.2879	(87)
Th 2	20.0459	20.0483	20.0507	20.0628	20.0652	20.0774	20.0774	20.0798	20.0725	20.0652	20.0604	20.0556	(88)
util rest of house													
	0.9981	0.9934	0.9689	0.8531	0.6337	0.4179	0.2778	0.3177	0.5817	0.9238	0.9935	0.9987	(89)
MIT 2	19.1388	19.3363	19.6448	19.9542	20.0537	20.0769	20.0773	20.0798	20.0680	19.8962	19.4635	19.1134	(90)
Living area fraction									fLA = Living area / (4) =			0.4747	(91)
MIT	19.6951	19.8627	20.1268	20.3985	20.4953	20.5147	20.5153	20.5166	20.5064	20.3412	19.9676	19.6710	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6951	19.8627	20.1268	20.3985	20.4953	20.5147	20.5153	20.5166	20.5064	20.3412	19.9676	19.6710	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9978	0.9929	0.9698	0.8674	0.6633	0.4510	0.3128	0.3554	0.6215	0.9330	0.9932	0.9984	(94)
Useful gains	380.0100	440.3640	503.2946	523.0011	437.0954	294.5016	195.1804	204.5879	317.6676	401.9722	373.9359	360.4720	(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													
	796.4409	771.9092	701.0245	583.2252	444.8455	294.8766	195.1993	204.6361	321.2415	492.6859	654.5303	791.4247	(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													
	309.8246	222.7984	147.1111	43.3613	5.7661	0.0000	0.0000	0.0000	0.0000	67.4910	202.0280	320.6288	(98)
Space heating												1319.0091	(98)
Space heating per m2											(98) / (4) =	26.6466	(99)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Boilers	1.0000	(303a)
Fraction of total space heat from community Boilers	1.0000	(304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.1000	(306)
Space heating:		
Annual space heating requirement	1319.0091	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.10	1450.9100	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	1769.4263	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.10	1946.3689	(310a)
Electricity used for heat distribution	33.9728	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.2500, SFP = 0.6625)		
mechanical ventilation fans (SFP = 0.6625)	102.0214	(330a)
Total electricity for the above, kWh/year	102.0214	(331)
Electricity for lighting (calculated in Appendix L)	229.7650	(332)
Total delivered energy for all uses	3729.0653	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Boilers			93.9000	(367a)
Space heating from Boilers	3617.9755	0.2160	781.4827	(367)
Electrical energy for heat distribution	33.9728	0.5190	17.6319	(372)
Total CO2 associated with community systems			799.1146	(373)
(negative value allowed since DFEE <= TFEE)				
Space and water heating			799.1146	(376)
Pumps and fans	102.0214	0.5190	52.9491	(378)
Energy for lighting	229.7650	0.5190	119.2480	(379)
Total CO2, kg/year			971.3117	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			19.6200	(384)

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

DER		19.6200	ZC1
Total Floor Area	TFA	49.5000	
Assumed number of occupants	N	1.6754	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.4704	ZC2
CO2 emissions from cooking, equation (L16)		3.2164	ZC3
Total CO2 emissions		40.3067	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		40.3067	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	49.5000 (1b)	x	2.5500 (2b)	=	126.2250	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.5000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	126.2250	(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)

			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000	/ (5) =	0.1584	(8)
Pressure test			Yes	
Measured/design AP50			5.0000	
Infiltration rate			0.4084	(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) =		0.3778	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4817	0.4723	0.4628	0.4156	0.4061	0.3589	0.3589	0.3495	0.3778	0.4061	0.4250	0.4439	(22b)
Effective ac	0.6160	0.6115	0.6071	0.5864	0.5825	0.5644	0.5644	0.5611	0.5714	0.5825	0.5903	0.5985	(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 Semi-glazed door			2.1000	1.2000	2.5200			(26a)
TER Opening Type (Uw = 1.40)			10.2700	1.3258	13.6155			(27)
External Wall 1	55.6000	10.2700	45.3300	0.1800	8.1594			(29a)
stair wall	22.2000	2.1000	20.1000	0.1800	3.6180			(29a)
Total net area of external elements Aum(A, m2)			77.8000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.9129			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	4.3455	(36)
Total fabric heat loss (33) + (36) =	32.2584	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	25.6600	25.4723	25.2884	24.4244	24.2627	23.5102	23.5102	23.3708	23.8001	24.2627	24.5897	24.9316	(38)
Heat transfer coeff	57.9184	57.7308	57.5468	56.6828	56.5211	55.7686	55.7686	55.6293	56.0585	56.5211	56.8482	57.1901	(39)
Average = Sum(39)m / 12 =												56.6820	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1701	1.1663	1.1626	1.1451	1.1418	1.1266	1.1266	1.1238	1.1325	1.1418	1.1484	1.1554	(40)
HLP (average)												1.1451	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.6754 (42)
Average daily hot water use (litres/day)	73.9905 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	81.3896	78.4299	75.4703	72.5107	69.5511	66.5915	66.5915	69.5511	72.5107	75.4703	78.4299	81.3896	(44)
Energy conte	120.6984	105.5636	108.9321	94.9697	91.1257	78.6345	72.8664	83.6153	84.6139	98.6094	107.6399	116.8899	(45)
Energy content (annual)										Total = Sum(45)m =		1164.1588	(45)
Distribution loss (46)m = 0.15 x (45)m	18.1048	15.8345	16.3398	14.2455	13.6688	11.7952	10.9300	12.5423	12.6921	14.7914	16.1460	17.5335	(46)

Water storage loss:	
Store volume	2.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	0.2388 (48)
Temperature factor from Table 2b	0.5400 (49)
Enter (49) or (54) in (55)	0.1290 (55)
Total storage loss	

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

	3.9977	3.6109	3.9977	3.8688	3.9977	3.8688	3.9977	3.9977	3.8688	3.9977	3.8688	3.9977	(56)
If cylinder contains dedicated solar storage													
	3.9977	3.6109	3.9977	3.8688	3.9977	3.8688	3.9977	3.9977	3.8688	3.9977	3.8688	3.9977	(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													
	147.9585	130.1856	136.1923	121.3505	118.3858	105.0153	100.1266	110.8755	110.9947	125.8695	134.0206	144.1501	(62)
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													
	147.9585	130.1856	136.1923	121.3505	118.3858	105.0153	100.1266	110.8755	110.9947	125.8695	134.0206	144.1501	(64)
								Total per year (kWh/year) = Sum(64)m =				1485.1250	(64)
Heat gains from water heating, kWh/month													
	61.9403	54.7975	58.0280	52.6820	52.1074	47.2506	46.0362	49.6102	49.2388	54.5957	56.8949	60.6740	(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	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	13.0577	11.5978	9.4319	7.1406	5.3377	4.5063	4.8692	6.3292	8.4950	10.7863	12.5893	13.4206	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	145.9354	147.4497	143.6336	135.5095	125.2544	115.6159	109.1769	107.6625	111.4787	119.6027	129.8579	139.4963	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	(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)													
	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	(71)
Water heating gains (Table 5)													
	83.2531	81.5440	77.9947	73.1695	70.0368	65.6258	61.8766	66.6804	68.3872	73.3814	79.0207	81.5511	(72)
Total internal gains													
	293.3771	291.7223	282.1911	266.9505	251.7597	236.8789	227.0536	231.8029	239.4917	254.9013	272.5987	285.5989	(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	5.3800	19.6403	0.6300	0.7000	0.7700	32.2925	(76)
West	4.8900	19.6403	0.6300	0.7000	0.7700	29.3513	(80)

Solar gains	61.6438	120.5884	198.5919	289.6345	354.9579	363.3626	345.9360	297.1539	230.9706	143.0883	76.8626	50.6929	(83)
Total gains	355.0209	412.3107	480.7830	556.5849	606.7176	600.2415	572.9896	528.9568	470.4623	397.9896	349.4613	336.2918	(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	59.3507	59.5436	59.7340	60.6445	60.8179	61.6386	61.6386	61.7930	61.3199	60.8179	60.4681	60.1066	
alpha	4.9567	4.9696	4.9823	5.0430	5.0545	5.1092	5.1092	5.1195	5.0880	5.0545	5.0312	5.0071	
util living area													
	0.9956	0.9901	0.9718	0.9083	0.7698	0.5770	0.4250	0.4776	0.7447	0.9503	0.9907	0.9966	(86)
MIT	19.8397	20.0140	20.3049	20.6576	20.8886	20.9798	20.9965	20.9938	20.9306	20.6017	20.1574	19.8141	(87)
Th 2	19.9440	19.9471	19.9501	19.9642	19.9668	19.9791	19.9791	19.9814	19.9744	19.9668	19.9615	19.9559	(88)
util rest of house													
	0.9941	0.9869	0.9625	0.8801	0.7106	0.4924	0.3281	0.3751	0.6614	0.9286	0.9871	0.9955	(89)
MIT 2	18.4125	18.6677	19.0871	19.5822	19.8663	19.9669	19.9779	19.9791	19.9238	19.5220	18.8880	18.3837	(90)
Living area fraction									fLA = Living area / (4) =			0.4747	(91)
MIT	19.0901	19.3068	19.6652	20.0928	20.3517	20.4477	20.4615	20.4608	20.4017	20.0346	19.4907	19.0628	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0901	19.3068	19.6652	20.0928	20.3517	20.4477	20.4615	20.4608	20.4017	20.0346	19.4907	19.0628	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9925	0.9843	0.9594	0.8840	0.7339	0.5321	0.3743	0.4239	0.6981	0.9303	0.9850	0.9942	(94)
Useful gains	352.3662	405.8536	461.2712	492.0255	445.2601	319.3615	214.4415	224.2304	328.4427	370.2658	344.2066	334.3271	(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													
	856.6178	831.7178	757.6175	634.4370	489.0012	326.1207	215.3495	225.9004	353.2663	533.2545	704.3860	850.0047	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	375.1631	286.1807	220.4816	102.5363	32.5434	0.0000	0.0000	0.0000	0.0000	121.2635	259.3292	383.6641	(98)
Space heating												1781.1621	(98)
Space heating per m2											(98) / (4) =	35.9831	(99)

8c. Space cooling requirement

Not applicable

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												1904.9862	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	375.1631	286.1807	220.4816	102.5363	32.5434	0.0000	0.0000	0.0000	0.0000	121.2635	259.3292	383.6641	(98)
Space heating efficiency (main heating system 1)													
	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)													
	401.2440	306.0757	235.8092	109.6645	34.8058	0.0000	0.0000	0.0000	0.0000	129.6936	277.3574	410.3359	(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													
	147.9585	130.1856	136.1923	121.3505	118.3858	105.0153	100.1266	110.8755	110.9947	125.8695	134.0206	144.1501	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.1933	86.8585	86.0922	84.3684	81.8876	79.8000	79.8000	79.8000	79.8000	84.7147	86.5461	87.3030	(217)
Fuel for water heating, kWh/month													
	169.6903	149.8824	158.1936	143.8340	144.5711	131.5981	125.4719	138.9417	139.0911	148.5806	154.8546	165.1147	(219)
Water heating fuel used												1769.8242	(219)
Annual totals kWh/year													
Space heating fuel - main system												1904.9862	(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)												230.6035	(232)
Total delivered energy for all uses												3980.4138	(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	1904.9862	0.2160	411.4770	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1769.8242	0.2160	382.2820	(264)
Space and water heating			793.7590	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	230.6035	0.5190	119.6832	(268)
Total CO2, kg/m2/year			952.3672	(272)
Emissions per m2 for space and water heating			16.0355	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.4178	(272b)
Emissions per m2 for pumps and fans			0.7864	(272c)
Target Carbon Dioxide Emission Rate (TER) = (16.0355 * 1.00) + 2.4178 + 0.7864, rounded to 2 d.p.			19.2400	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	D-1/2-02	**Issued on Date**	05/02/2020
Assessment Reference	ASHP - Be lean	**Prop Type Ref**	2bed 3F
Property			

SAP Rating	83 B	**DER**	17.34	**TER**	17.51
Environmental	89 B	**% DER<TER**	0.96		
CO_2 Emissions (t/year)	0.76	**DFEE**	40.68	**TFEE**	42.07
General Requirements Compliance	Fail	**% DFEE<TFEE**	3.29		

Assessor Details	Miss Claudia Cioli, Claudia Cioli, Tel: 07481524839, clacioli@gmail.com	**Assessor ID**	R479-0001
Client			

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

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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England
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DWELLING AS DESIGNED

Top-floor flat, total floor area 51 m²

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

1a TER and DER
Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 17.51 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 17.34 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)42.1 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)40.7 kWh/m²/yrOK

---
2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction

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

---
4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage Measured cylinder loss: 0.74 kWh/day
Permitted by DBSCG 0.32 Fail
Primary pipework insulated: No primary pipework

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

Hot water controls: No cylinderstat

---
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: 94%
Minimum: 70% OK

---
9 Summertime temperature
Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing East: 3.33 m², No overhang
Windows facing South: 12.19 m², No overhang
Air change rate: 0.50 ach
Blinds/curtains: None

---
10 Key features
Party wall U-value 0.00 W/m²K
Air permeability 3.0 m³/m²h

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	51.4000 (1b)	x	2.5500 (2b)	=	131.0700	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.4000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	131.0700	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							0 * 10 =	0.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.0000	
Infiltration rate		0.1500	(18)
Number of sides sheltered		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

If mechanical ventilation:	0.5000	(23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	79.9000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2774	0.2739	0.2705	0.2531	0.2497	0.2323	0.2323	0.2288	0.2393	0.2497	0.2566	0.2635	(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	
W03 (Uw = 1.40)			8.3900	1.3258	11.1231			(27)
W02 (Uw = 1.40)			7.1300	1.3258	9.4527			(27)
door			2.1000	1.4000	2.9400			(26a)
External Wall 1	57.1000	15.5200	41.5800	0.1800	7.4844	140.0000	5821.2000	(29a)
stair wall	13.5000	2.1000	11.4000	0.1800	2.0520	140.0000	1596.0000	(29a)
Total net area of external elements Aum(A, m2)			70.6000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		33.0522			(33)
Party Wall 1			8.4000	0.0000	0.0000	140.0000	1176.0000	(32)
Party Floor 1			51.4000			80.0000	4112.0000	(32d)
Party Ceilings 1			51.4000			80.0000	4112.0000	(32b)
Internal Wall			95.0000			9.0000	855.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 17672.2000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	343.8171	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	7.1785	(36)
Total fabric heat loss	(33) + (36) = 40.2307	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	11.9987	11.8486	11.6986	10.9484	10.7984	10.0482	10.0482	9.8982	10.3483	10.7984	11.0985	11.3985	(38)
Heat transfer coeff	52.2293	52.0793	51.9293	51.1791	51.0291	50.2789	50.2789	50.1289	50.5790	51.0291	51.3291	51.6292	(39)
Average = Sum(39)m / 12 =												51.1416	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0161	1.0132	1.0103	0.9957	0.9928	0.9782	0.9782	0.9753	0.9840	0.9928	0.9986	1.0045	(40)
HLP (average)												0.9950	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.7314 (42)
Average daily hot water use (litres/day)	79.2842 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	87.2127	84.0413	80.8699	77.6986	74.5272	71.3558	71.3558	74.5272	77.6986	80.8699	84.0413	87.2127	(44)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy conte	129.3339	113.1162	116.7258	101.7644	97.6454	84.2605	78.0798	89.5977	90.6677	105.6645	115.3411	125.2529	(45)
Energy content (annual)										Total = Sum(45)m =		1247.4498	(45)
Distribution loss (46)m = 0.15 x (45)m													
	19.4001	16.9674	17.5089	15.2647	14.6468	12.6391	11.7120	13.4396	13.6002	15.8497	17.3012	18.7879	(46)
Water storage loss:													
Store volume												2.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.7400	(48)
Temperature factor from Table 2b												1.0000	(49)
Enter (49) or (54) in (55)												0.7400	(55)
Total storage loss													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(56)
If cylinder contains dedicated solar storage													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(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													
	175.5363	154.8474	162.9282	146.4764	143.8478	128.9725	124.2822	135.8001	135.3797	151.8669	160.0531	171.4553	(62)
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													
	175.5363	154.8474	162.9282	146.4764	143.8478	128.9725	124.2822	135.8001	135.3797	151.8669	160.0531	171.4553	(64)
								Total per year (kWh/year) = Sum(64)m =				1791.4458	(64)
Heat gains from water heating, kWh/month													
	79.9654	70.9961	75.7733	69.6063	69.4290	63.7862	62.9234	66.7531	65.9166	72.0954	74.1205	78.6085	(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	86.5685	86.5685	86.5685	86.5685	86.5685	86.5685	86.5685	86.5685	86.5685	86.5685	86.5685	86.5685	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	13.4501	11.9463	9.7153	7.3551	5.4981	4.6417	5.0155	6.5193	8.7503	11.1105	12.9675	13.8239	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	150.8691	152.4347	148.4896	140.0908	129.4890	119.5247	112.8679	111.3024	115.2475	123.6462	134.2481	144.2124	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.6568	31.6568	31.6568	31.6568	31.6568	31.6568	31.6568	31.6568	31.6568	31.6568	31.6568	31.6568	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-69.2548	-69.2548	-69.2548	-69.2548	-69.2548	-69.2548	-69.2548	-69.2548	-69.2548	-69.2548	-69.2548	-69.2548	(71)
Water heating gains (Table 5)													
	107.4804	105.6490	101.8458	96.6754	93.3185	88.5920	84.5745	89.7220	91.5509	96.9024	102.9451	105.6566	(72)
Total internal gains													
	320.7702	319.0005	309.0212	293.0919	277.2761	261.7289	251.4285	256.5142	264.5192	280.6296	299.1314	312.6635	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	8.3900	46.7521	0.3700	0.8900	0.7700	89.5133	(78)
East	3.3300	19.6403	0.5600	0.6800	0.7700	17.2592	(76)
South	3.8000	46.7521	0.5600	0.6800	0.7700	46.8829	(78)

Solar gains	153.6555	257.1446	340.1513	402.6949	434.5115	424.2517	411.9743	389.2214	361.9129	281.0007	183.1963	132.0521	(83)
Total gains	474.4257	576.1451	649.1726	695.7867	711.7876	685.9806	663.4028	645.7356	626.4320	561.6303	482.3277	444.7155	(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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	93.9883	94.2590	94.5314	95.9170	96.1990	97.6343	97.6343	97.9265	97.0551	96.1990	95.6366	95.0808	
alpha	7.2659	7.2839	7.3021	7.3945	7.4133	7.5090	7.5090	7.5284	7.4703	7.4133	7.3758	7.3387	
util living area													
	0.9945	0.9787	0.9341	0.8237	0.6553	0.4682	0.3334	0.3570	0.5540	0.8547	0.9812	0.9964	(86)
MIT	20.4250	20.6055	20.7893	20.9336	20.9883	20.9992	20.9999	20.9999	20.9972	20.9270	20.6542	20.3897	(87)
Th 2	20.0699	20.0723	20.0748	20.0869	20.0894	20.1015	20.1015	20.1040	20.0967	20.0894	20.0845	20.0796	(88)
util rest of house													
	0.9922	0.9707	0.9125	0.7801	0.5958	0.4030	0.2654	0.2875	0.4831	0.8067	0.9727	0.9948	(89)
MIT 2	19.3276	19.5865	19.8379	20.0241	20.0809	20.1012	20.1015	20.1040	20.0952	20.0235	19.6684	19.2844	(90)
Living area fraction										fLA = Living area / (4) =		0.4339	(91)
MIT	19.8037	20.0286	20.2506	20.4187	20.4746	20.4908	20.4913	20.4927	20.4865	20.4155	20.0961	19.7639	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8037	20.0286	20.2506	20.4187	20.4746	20.4908	20.4913	20.4927	20.4865	20.4155	20.0961	19.7639	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9914	0.9703	0.9171	0.7967	0.6214	0.4313	0.2949	0.3177	0.5139	0.8251	0.9729	0.9941	(94)
Useful gains	470.3374	559.0242	595.3440	554.3276	442.3035	295.8738	195.6365	205.1361	321.9084	463.3746	469.2449	442.1121	(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													
	809.7466	787.8858	714.0609	589.5149	447.7598	296.1811	195.6509	205.1611	323.0233	500.8760	667.0788	803.5525	(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													
	252.5205	153.7950	88.3254	25.3349	4.0595	0.0000	0.0000	0.0000	0.0000	27.9010	142.4404	268.9117	(98)
Space heating												963.2883	(98)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Space heating per m2	(98) / (4) =	18.7410 (99)

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1000 (306)
Space heating:	
Annual space heating requirement	963.2883 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.10	1059.6171 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1791.4458 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.10	1970.5904 (310a)
Electricity used for heat distribution	30.3021 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.2500, SFP = 0.6625)	
mechanical ventilation fans (SFP = 0.6625)	105.9373 (330a)
Total electricity for the above, kWh/year	105.9373 (331)
Electricity for lighting (calculated in Appendix L)	237.5329 (332)
Total delivered energy for all uses	3373.6777 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Boilers			93.9000	(367a)
Space heating from Boilers	3227.0581	0.2160	697.0445	(367)
Electrical energy for heat distribution	30.3021	0.5190	15.7268	(372)
Total CO2 associated with community systems			712.7713	(373)
(negative value allowed since DFEE <= TFEE)				
Space and water heating			712.7713	(376)
Pumps and fans	105.9373	0.5190	54.9815	(378)
Energy for lighting	237.5329	0.5190	123.2796	(379)
Total CO2, kg/year			891.0323	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			17.3400	(384)

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

DER		17.3400	ZC1
Total Floor Area	TFA	51.4000	
Assumed number of occupants	N	1.7314	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.3934	ZC2
CO2 emissions from cooking, equation (L16)		3.1236	ZC3
Total CO2 emissions		37.8570	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		37.8570	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	51.4000 (1b)	x	2.5500 (2b)	=	131.0700	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.4000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	131.0700	(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)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1526	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.4026	(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) =	0.3724	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4748	0.4655	0.4562	0.4096	0.4003	0.3538	0.3538	0.3445	0.3724	0.4003	0.4189	0.4376	(22b)
Effective ac	0.6127	0.6083	0.6041	0.5839	0.5801	0.5626	0.5626	0.5593	0.5693	0.5801	0.5878	0.5957	(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 Semi-glazed door			2.1000	1.2000	2.5200			(26a)
TER Opening Type (Uw = 1.40)			10.7500	1.3258	14.2519			(27)
External Wall 1	57.1000	10.7500	46.3500	0.1800	8.3430			(29a)
stair wall	13.5000	2.1000	11.4000	0.1800	2.0520			(29a)
Total net area of external elements Aum(A, m2)			70.6000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.1669			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	5.2610	(36)
Total fabric heat loss (33) + (36) =	32.4279	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.5020	26.3127	26.1271	25.2555	25.0924	24.3333	24.3333	24.1927	24.6257	25.0924	25.4223	25.7672	(38)
Heat transfer coeff	58.9299	58.7406	58.5550	57.6834	57.5203	56.7612	56.7612	56.6206	57.0536	57.5203	57.8502	58.1951	(39)
Average = Sum(39)m / 12 =												57.6826	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1465	1.1428	1.1392	1.1222	1.1191	1.1043	1.1043	1.1016	1.1100	1.1191	1.1255	1.1322	(40)
HLP (average)												1.1222	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.7314 (42)
Average daily hot water use (litres/day)	75.3200 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	82.8520	79.8392	76.8264	73.8136	70.8008	67.7880	67.7880	70.8008	73.8136	76.8264	79.8392	82.8520	(44)
Energy conte	122.8672	107.4604	110.8895	96.6762	92.7631	80.0475	74.1758	85.1178	86.1344	100.3813	109.5740	118.9903	(45)
Energy content (annual)										Total = Sum(45)m =		1185.0773	(45)
Distribution loss (46)m = 0.15 x (45)m	18.4301	16.1191	16.6334	14.5014	13.9145	12.0071	11.1264	12.7677	12.9202	15.0572	16.4361	17.8485	(46)

Water storage loss:	
Store volume	2.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	0.2388 (48)
Temperature factor from Table 2b	0.5400 (49)
Enter (49) or (54) in (55)	0.1290 (55)
Total storage loss	

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

	3.9977	3.6109	3.9977	3.8688	3.9977	3.8688	3.9977	3.9977	3.8688	3.9977	3.8688	3.9977	(56)
If cylinder contains dedicated solar storage													
	3.9977	3.6109	3.9977	3.8688	3.9977	3.8688	3.9977	3.9977	3.8688	3.9977	3.8688	3.9977	(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													
	150.1273	132.0825	138.1497	123.0570	120.0232	106.4283	101.4359	112.3779	112.5151	127.6414	135.9548	146.2504	(62)
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													
	150.1273	132.0825	138.1497	123.0570	120.0232	106.4283	101.4359	112.3779	112.5151	127.6414	135.9548	146.2504	(64)
								Total per year (kWh/year) = Sum(64)m =				1506.0435	(64)
Heat gains from water heating, kWh/month													
	62.6614	55.4282	58.6789	53.2495	52.6518	47.7204	46.4716	50.1098	49.7443	55.1849	57.5380	61.3724	(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	86.5685	86.5685	86.5685	86.5685	86.5685	86.5685	86.5685	86.5685	86.5685	86.5685	86.5685	86.5685	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	13.4909	11.9825	9.7448	7.3775	5.5147	4.6558	5.0307	6.5391	8.7768	11.1442	13.0069	13.8659	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	150.8691	152.4347	148.4896	140.0908	129.4890	119.5247	112.8679	111.3024	115.2475	123.6462	134.2481	144.2124	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.6568	31.6568	31.6568	31.6568	31.6568	31.6568	31.6568	31.6568	31.6568	31.6568	31.6568	31.6568	(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)													
	-69.2548	-69.2548	-69.2548	-69.2548	-69.2548	-69.2548	-69.2548	-69.2548	-69.2548	-69.2548	-69.2548	-69.2548	(71)
Water heating gains (Table 5)													
	84.2224	82.4825	78.8695	73.9576	70.7686	66.2784	62.4618	67.3518	69.0893	74.1732	79.9139	82.4898	(72)
Total internal gains													
	300.5530	298.8703	289.0744	273.3964	257.7429	242.4294	232.3310	237.1639	245.0842	260.9342	279.1395	292.5386	(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	2.3100	19.6403	0.6300	0.7000	0.7700	13.8654	(76)
South	8.4400	46.7521	0.6300	0.7000	0.7700	120.5910	(78)

Solar gains	134.4564	224.6206	296.2449	349.4824	376.1350	366.8741	356.4134	337.4001	314.7526	245.2035	160.2300	115.6040	(83)
Total gains	435.0094	523.4909	585.3193	622.8788	633.8779	609.3035	588.7444	574.5640	559.8368	506.1378	439.3695	408.1426	(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	60.5710	60.7662	60.9588	61.8799	62.0554	62.8853	62.8853	63.0415	62.5630	62.0554	61.7015	61.3358	
alpha	5.0381	5.0511	5.0639	5.1253	5.1370	5.1924	5.1924	5.2028	5.1709	5.1370	5.1134	5.0891	
util living area													
	0.9908	0.9768	0.9472	0.8804	0.7588	0.5791	0.4213	0.4492	0.6651	0.8983	0.9788	0.9931	(86)
MIT	19.9887	20.2053	20.4606	20.7253	20.9008	20.9808	20.9969	20.9957	20.9607	20.7362	20.3135	19.9508	(87)
Th 2	19.9630	19.9660	19.9689	19.9827	19.9853	19.9973	19.9973	19.9996	19.9927	19.9853	19.9801	19.9746	(88)
util rest of house													
	0.9879	0.9699	0.9319	0.8474	0.6997	0.4957	0.3269	0.3537	0.5826	0.8628	0.9713	0.9910	(89)
MIT 2	18.6422	18.9552	19.3167	19.6829	19.8963	19.9856	19.9963	19.9979	19.9656	19.7077	19.1243	18.5958	(90)
Living area fraction									fLA = Living area / (4) =			0.4339	(91)
MIT	19.2264	19.4976	19.8130	20.1352	20.3321	20.4174	20.4304	20.4308	20.3973	20.1539	19.6402	19.1837	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2264	19.4976	19.8130	20.1352	20.3321	20.4174	20.4304	20.4308	20.3973	20.1539	19.6402	19.1837	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9852	0.9661	0.9292	0.8529	0.7210	0.5314	0.3680	0.3952	0.6170	0.8695	0.9682	0.9887	(94)
Useful gains	428.5853	505.7321	543.8524	531.2384	457.0122	323.7709	216.6380	227.0951	345.3966	440.0616	425.3786	403.5386	(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													
	879.6094	857.4694	779.5446	648.0835	496.5225	330.1998	217.4172	228.2269	359.2853	549.5448	725.4556	871.9781	(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													
	335.5619	236.3675	175.3550	84.1285	29.3956	0.0000	0.0000	0.0000	0.0000	81.4555	216.0554	348.5190	(98)
Space heating												1506.8384	(98)
Space heating per m2											(98) / (4) =	29.3159	(99)

8c. Space cooling requirement

Not applicable

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												1611.5919	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	335.5619	236.3675	175.3550	84.1285	29.3956	0.0000	0.0000	0.0000	0.0000	81.4555	216.0554	348.5190	(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)													
	358.8897	252.7994	187.5455	89.9770	31.4392	0.0000	0.0000	0.0000	0.0000	87.1182	231.0753	372.7476	(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													
	150.1273	132.0825	138.1497	123.0570	120.0232	106.4283	101.4359	112.3779	112.5151	127.6414	135.9548	146.2504	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.8984	86.3494	85.4510	83.8243	81.7004	79.8000	79.8000	79.8000	79.8000	83.6529	86.0440	87.0498	(217)
Fuel for water heating, kWh/month													
	172.7619	152.9628	161.6712	146.8035	146.9066	133.3688	127.1127	140.8245	140.9964	152.5846	158.0061	168.0078	(219)
Water heating fuel used												1802.0065	(219)
Annual totals kWh/year													
Space heating fuel - main system												1611.5919	(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)												238.2541	(232)
Total delivered energy for all uses												3726.8525	(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	1611.5919	0.2160	348.1038	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1802.0065	0.2160	389.2334	(264)
Space and water heating			737.3373	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	238.2541	0.5190	123.6539	(268)
Total CO2, kg/m2/year			899.9161	(272)
Emissions per m2 for space and water heating			14.3451	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.4057	(272b)
Emissions per m2 for pumps and fans			0.7573	(272c)
Target Carbon Dioxide Emission Rate (TER) = (14.3451 * 1.00) + 2.4057 + 0.7573, rounded to 2 d.p.			17.5100	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	D-3-01	**Issued on Date**	05/02/2020
Assessment Reference	ASHP - Be lean	**Prop Type Ref**	2bed 3F
Property			

SAP Rating	79 C	**DER**	24.79	**TER**	23.68
Environmental	84 B	**% DER<TER**	-4.69		
CO_2 Emissions (t/year)	1.03	**DFEE**	69.97	**TFEE**	73.17
General Requirements Compliance	Fail	**% DFEE<TFEE**	4.38		

Assessor Details	Miss Claudia Cioli, Claudia Cioli, Tel: 07481524839, clacioli@gmail.com	**Assessor ID**	R479-0001
Client			

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DWELLING AS DESIGNED

Mid-floor flat, total floor area 50 m²

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

1a TER and DER
Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 23.68 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 24.79 kgCO□/m²Fail
Excess emissions =1.11 kgCO□/m² (4.7%)

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)73.2 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)70.0 kWh/m²/yrOK
---
2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	OK
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction
---
3 Air permeability
Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK
---
4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None
---
5 Cylinder insulation
Hot water storage Measured cylinder loss: 0.74 kWh/day
Permitted by DBSCG 0.32 Fail
Primary pipework insulated: No primary pipework
---
6 Controls
Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinderstat

---
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: 94%
Minimum: 70% OK
---
9 Summertime temperature
Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing East: 7.32 m², Overhang width less than twice window, ratio 1.00
Windows facing West: 6.66 m², No overhang
Air change rate: 0.50 ach
Blinds/curtains: None
---
10 Key features
Party wall U-value 0.00 W/m²K
Air permeability 3.0 m³/m²h

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	49.5000 (1b)	x	2.5500 (2b)	=	126.2250	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.5000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	126.2250	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							0 * 10 =	0.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.0000	
Infiltration rate		0.1500	(18)
Number of sides sheltered		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

If mechanical ventilation:	0.5000	(23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	79.9000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2774	0.2739	0.2705	0.2531	0.2497	0.2323	0.2323	0.2288	0.2393	0.2497	0.2566	0.2635	(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	
W29 (Uw = 1.40)			7.3200	1.3258	9.7045			(27)
W02 (Uw = 1.40)			6.6600	1.3258	8.8295			(27)
door			2.1000	1.4000	2.9400			(26a)
External Wall 1	55.6000	13.9800	41.6200	0.1800	7.4916	140.0000	5826.8000	(29a)
stair wall	22.2000	2.1000	20.1000	0.1800	3.6180	140.0000	2814.0000	(29a)
External Roof 1	49.5000		49.5000	0.1300	6.4350	9.0000	445.5000	(30)
Total net area of external elements Aum(A, m2)			127.3000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.0187			(33)
Party Wall 1			5.1000	0.0000	0.0000	140.0000	714.0000	(32)
Party Floor 1			49.5000			80.0000	3960.0000	(32d)
Internal Wall			64.4000			9.0000	579.6000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	14339.9000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		289.6949 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)		18.7175 (36)
Total fabric heat loss	(33) + (36) =	57.7362 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	11.5551	11.4107	11.2662	10.5437	10.3992	9.6768	9.6768	9.5323	9.9658	10.3992	10.6882	10.9772	(38)
Heat transfer coeff	69.2913	69.1469	69.0024	68.2799	68.1354	67.4130	67.4130	67.2685	67.7020	68.1354	68.4244	68.7134	(39)
Average = Sum(39)m / 12 =												68.2438	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3998	1.3969	1.3940	1.3794	1.3765	1.3619	1.3619	1.3590	1.3677	1.3765	1.3823	1.3881	(40)
HLP (average)												1.3787	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.6754 (42)
Average daily hot water use (litres/day)	77.8847 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	85.6732	82.5578	79.4424	76.3270	73.2117	70.0963	70.0963	73.2117	76.3270	79.4424	82.5578	85.6732	(44)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy conte	127.0509	111.1195	114.6654	99.9681	95.9218	82.7732	76.7015	88.0161	89.0673	103.7994	113.3051	123.0420	(45)
Energy content (annual)										Total = Sum(45)m =		1225.4303	(45)
Distribution loss (46)m = 0.15 x (45)m													
	19.0576	16.6679	17.1998	14.9952	14.3883	12.4160	11.5052	13.2024	13.3601	15.5699	16.9958	18.4563	(46)
Water storage loss:													
Store volume												2.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.7400	(48)
Temperature factor from Table 2b												1.0000	(49)
Enter (49) or (54) in (55)												0.7400	(55)
Total storage loss													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(56)
If cylinder contains dedicated solar storage													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(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													
	173.2533	152.8507	160.8678	144.6801	142.1242	127.4852	122.9039	134.2185	133.7793	150.0018	158.0171	169.2444	(62)
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													
	173.2533	152.8507	160.8678	144.6801	142.1242	127.4852	122.9039	134.2185	133.7793	150.0018	158.0171	169.2444	(64)
									Total per year (kWh/year) = Sum(64)m =			1769.4263	(64)
Heat gains from water heating, kWh/month													
	79.2063	70.3322	75.0882	69.0090	68.8559	63.2917	62.4652	66.2273	65.3845	71.4752	73.4436	77.8734	(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	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	13.0102	11.5556	9.3976	7.1146	5.3183	4.4899	4.8515	6.3062	8.4641	10.7471	12.5435	13.3718	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	145.9354	147.4497	143.6336	135.5095	125.2544	115.6159	109.1769	107.6625	111.4787	119.6027	129.8579	139.4963	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	(71)
Water heating gains (Table 5)													
	106.4601	104.6610	100.9250	95.8458	92.5483	87.9051	83.9586	89.0152	90.8118	96.0688	102.0049	104.6685	(72)
Total internal gains													
	313.5366	311.7972	302.0870	286.6008	271.2517	256.1418	246.1178	251.1147	258.8854	274.5495	292.5372	305.6675	(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	7.3200	19.6403	0.3700	0.8900	0.7700	32.8083	(76)
West	6.6600	19.6403	0.5600	0.6800	0.7700	34.5185	(80)

Solar gains	67.3268	131.7054	216.9001	316.3358	387.6814	396.8609	377.8278	324.5485	252.2638	156.2796	83.9486	55.3662	(83)
Total gains	380.8634	443.5026	518.9871	602.9366	658.9331	653.0027	623.9456	575.6632	511.1491	430.8291	376.4857	361.0338	(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	57.4863	57.6065	57.7271	58.3379	58.4616	59.0881	59.0881	59.2150	58.8359	58.4616	58.2147	57.9699	
alpha	4.8324	4.8404	4.8485	4.8892	4.8974	4.9392	4.9392	4.9477	4.9224	4.8974	4.8810	4.8647	
util living area													
	0.9969	0.9930	0.9796	0.9313	0.8138	0.6291	0.4690	0.5257	0.7917	0.9638	0.9934	0.9976	(86)
MIT	19.7403	19.9093	20.2019	20.5698	20.8416	20.9663	20.9935	20.9889	20.8983	20.5229	20.0624	19.7109	(87)
Th 2	19.7635	19.7657	19.7679	19.7792	19.7814	19.7927	19.7927	19.7949	19.7882	19.7814	19.7769	19.7724	(88)
util rest of house													
	0.9956	0.9902	0.9713	0.9040	0.7484	0.5243	0.3438	0.3942	0.6967	0.9436	0.9903	0.9966	(89)
MIT 2	18.1207	18.3679	18.7908	19.3084	19.6445	19.7744	19.7909	19.7915	19.7191	19.2598	18.6001	18.0840	(90)
Living area fraction									fLA = Living area / (4) =			0.4747	(91)
MIT	18.8896	19.0997	19.4607	19.9073	20.2128	20.3403	20.3618	20.3600	20.2789	19.8595	19.2943	18.8564	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8896	19.0997	19.4607	19.9073	20.2128	20.3403	20.3618	20.3600	20.2789	19.8595	19.2943	18.8564	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9944	0.9882	0.9687	0.9074	0.7735	0.5735	0.4036	0.4572	0.7386	0.9453	0.9886	0.9956	(94)
Useful gains	378.7343	438.2615	502.7463	547.0783	509.6774	374.5182	251.8246	263.1880	377.5536	407.2436	372.1979	359.4543	(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													
	1010.9322	981.8646	894.3196	751.5743	580.0223	386.9684	253.5965	266.3821	418.3223	630.8968	834.3898	1007.0878	(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													
	470.3552	365.3013	291.3306	147.2371	52.3366	0.0000	0.0000	0.0000	0.0000	166.3979	332.7782	481.8393	(98)
Space heating												2307.5762	(98)
Space heating per m2											(98) / (4) =	46.6177	(99)

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Boilers	1.0000	(303a)
Fraction of total space heat from community Boilers	1.0000	(304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.1000	(306)
Space heating:		
Annual space heating requirement	2307.5762	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.10	2538.3338	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	1769.4263	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.10	1946.3689	(310a)
Electricity used for heat distribution	44.8470	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.2500, SFP = 0.6625)		
mechanical ventilation fans (SFP = 0.6625)	102.0214	(330a)
Total electricity for the above, kWh/year	102.0214	(331)
Electricity for lighting (calculated in Appendix L)	229.7650	(332)
Total delivered energy for all uses	4816.4891	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Boilers			93.9000	(367a)
Space heating from Boilers	4776.0412	0.2160	1031.6249	(367)
Electrical energy for heat distribution	44.8470	0.5190	23.2756	(372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			1054.9005	(373)
Space and water heating			1054.9005	(376)
Pumps and fans	102.0214	0.5190	52.9491	(378)
Energy for lighting	229.7650	0.5190	119.2480	(379)
Total CO2, kg/year			1227.0976	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			24.7900	(384)

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

DER		24.7900	ZC1
Total Floor Area	TFA	49.5000	
Assumed number of occupants	N	1.6754	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.4704	ZC2
CO2 emissions from cooking, equation (L16)		3.2164	ZC3
Total CO2 emissions		45.4767	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		45.4767	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	49.5000 (1b)	x	2.5500 (2b)	=	126.2250	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.5000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	126.2250	(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)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1584	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.4084	(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) =	0.3778	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4817	0.4723	0.4628	0.4156	0.4061	0.3589	0.3589	0.3495	0.3778	0.4061	0.4250	0.4439	(22b)
Effective ac	0.6160	0.6115	0.6071	0.5864	0.5825	0.5644	0.5644	0.5611	0.5714	0.5825	0.5903	0.5985	(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 Semi-glazed door			2.1000	1.2000	2.5200			(26a)
TER Opening Type (Uw = 1.40)			10.2700	1.3258	13.6155			(27)
External Wall 1	55.6000	10.2700	45.3300	0.1800	8.1594			(29a)
stair wall	22.2000	2.1000	20.1000	0.1800	3.6180			(29a)
External Roof 1	49.5000		49.5000	0.1300	6.4350			(30)
Total net area of external elements Aum(A, m2)			127.3000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.3479			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.4685	(36)
Total fabric heat loss						(33) + (36) =	49.8164	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	25.6600	25.4723	25.2884	24.4244	24.2627	23.5102	23.5102	23.3708	23.8001	24.2627	24.5897	24.9316	(38)
Heat transfer coeff	75.4764	75.2888	75.1048	74.2408	74.0791	73.3266	73.3266	73.1873	73.6165	74.0791	74.4062	74.7481	(39)
Average = Sum(39)m / 12 =												74.2400	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.5248	1.5210	1.5173	1.4998	1.4965	1.4813	1.4813	1.4785	1.4872	1.4965	1.5032	1.5101	(40)
HLP (average)												1.4998	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.6754 (42)
Average daily hot water use (litres/day)		73.9905 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	81.3896	78.4299	75.4703	72.5107	69.5511	66.5915	66.5915	69.5511	72.5107	75.4703	78.4299	81.3896	(44)
Energy conte	120.6984	105.5636	108.9321	94.9697	91.1257	78.6345	72.8664	83.6153	84.6139	98.6094	107.6399	116.8899	(45)
Energy content (annual)										Total = Sum(45)m =		1164.1588	(45)
Distribution loss (46)m = 0.15 x (45)m	18.1048	15.8345	16.3398	14.2455	13.6688	11.7952	10.9300	12.5423	12.6921	14.7914	16.1460	17.5335	(46)

Water storage loss:	
Store volume	2.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	0.2388 (48)
Temperature factor from Table 2b	0.5400 (49)
Enter (49) or (54) in (55)	0.1290 (55)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss
3.9977 3.6109 3.9977 3.8688 3.9977 3.8688 3.9977 3.9977 3.8688 3.9977 3.8688 3.9977 (56)
If cylinder contains dedicated solar storage
3.9977 3.6109 3.9977 3.8688 3.9977 3.8688 3.9977 3.9977 3.8688 3.9977 3.8688 3.9977 (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
147.9585 130.1856 136.1923 121.3505 118.3858 105.0153 100.1266 110.8755 110.9947 125.8695 134.0206 144.1501 (62)
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
147.9585 130.1856 136.1923 121.3505 118.3858 105.0153 100.1266 110.8755 110.9947 125.8695 134.0206 144.1501 (64)
Total per year (kWh/year) = Sum(64)m = 1485.1250 (64)
Heat gains from water heating, kWh/month
61.9403 54.7975 58.0280 52.6820 52.1074 47.2506 46.0362 49.6102 49.2388 54.5957 56.8949 60.6740 (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	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	13.0577	11.5978	9.4319	7.1406	5.3377	4.5063	4.8692	6.3292	8.4950	10.7863	12.5893	13.4206	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	145.9354	147.4497	143.6336	135.5095	125.2544	115.6159	109.1769	107.6625	111.4787	119.6027	129.8579	139.4963	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	(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)													
	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	(71)
Water heating gains (Table 5)													
	83.2531	81.5440	77.9947	73.1695	70.0368	65.6258	61.8766	66.6804	68.3872	73.3814	79.0207	81.5511	(72)
Total internal gains													
	293.3771	291.7223	282.1911	266.9505	251.7597	236.8789	227.0536	231.8029	239.4917	254.9013	272.5987	285.5989	(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	5.3800	19.6403	0.6300	0.7000	0.7700	32.2925	(76)
West	4.8900	19.6403	0.6300	0.7000	0.7700	29.3513	(80)

Solar gains	61.6438	120.5884	198.5919	289.6345	354.9579	363.3626	345.9360	297.1539	230.9706	143.0883	76.8626	50.6929	(83)
Total gains	355.0209	412.3107	480.7830	556.5849	606.7176	600.2415	572.9896	528.9568	470.4623	397.9896	349.4613	336.2918	(84)

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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	45.5440	45.6575	45.7694	46.3020	46.4031	46.8793	46.8793	46.9686	46.6947	46.4031	46.1991	45.9878	
alpha	4.0363	4.0438	4.0513	4.0868	4.0935	4.1253	4.1253	4.1312	4.1130	4.0935	4.0799	4.0659	
util living area													
	0.9957	0.9915	0.9793	0.9411	0.8511	0.6956	0.5388	0.5968	0.8340	0.9665	0.9921	0.9965	(86)
MIT	19.3892	19.5723	19.9007	20.3320	20.6921	20.9074	20.9751	20.9624	20.7934	20.3115	19.7743	19.3608	(87)
Th 2	19.6690	19.6718	19.6746	19.6876	19.6901	19.7015	19.7015	19.7036	19.6971	19.6901	19.6851	19.6800	(88)
util rest of house													
	0.9942	0.9885	0.9716	0.9182	0.7936	0.5866	0.3916	0.4471	0.7478	0.9490	0.9887	0.9953	(89)
MIT 2	17.5696	17.8378	18.3141	18.9305	19.4015	19.6439	19.6935	19.6898	19.5394	18.9172	18.1423	17.5353	(90)
Living area fraction									fLA = Living area / (4) =			0.4747	(91)
MIT	18.4334	18.6613	19.0673	19.5958	20.0142	20.2437	20.3019	20.2940	20.1347	19.5791	18.9171	18.4020	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4334	18.6613	19.0673	19.5958	20.0142	20.2437	20.3019	20.2940	20.1347	19.5791	18.9171	18.4020	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9921	0.9854	0.9670	0.9163	0.8097	0.6352	0.4621	0.5186	0.7807	0.9471	0.9859	0.9936	(94)
Useful gains	352.2176	406.2735	464.9174	509.9808	491.2399	381.2791	264.7523	274.3318	367.2934	376.9226	344.5353	334.1402	(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													
	1066.7409	1036.0695	943.8668	794.0681	615.9100	413.8365	271.4504	284.9905	444.2548	665.1670	879.2667	1061.5690	(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													
	531.6053	423.2230	356.3383	204.5428	92.7546	0.0000	0.0000	0.0000	0.0000	214.4538	385.0066	541.2070	(98)
Space heating												2749.1315	(98)
Space heating per m2											(98) / (4) =	55.5380	(99)

8c. Space cooling requirement

Not applicable

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												2940.2476	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	531.6053	423.2230	356.3383	204.5428	92.7546	0.0000	0.0000	0.0000	0.0000	214.4538	385.0066	541.2070	(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)	568.5619	452.6449	381.1105	218.7624	99.2028	0.0000	0.0000	0.0000	0.0000	229.3623	411.7718	578.8311	(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	147.9585	130.1856	136.1923	121.3505	118.3858	105.0153	100.1266	110.8755	110.9947	125.8695	134.0206	144.1501	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.9329	87.7327	87.2645	86.1964	84.1719	79.8000	79.8000	79.8000	79.8000	86.2240	87.4715	88.0177	(217)
Fuel for water heating, kWh/month	168.2630	148.3890	156.0683	140.7837	140.6477	131.5981	125.4719	138.9417	139.0911	145.9797	153.2164	163.7739	(219)
Water heating fuel used												1752.2245	(219)
Annual totals kWh/year													
Space heating fuel - main system												2940.2476	(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)												230.6035	(232)
Total delivered energy for all uses												4998.0756	(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	2940.2476	0.2160	635.0935	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1752.2245	0.2160	378.4805	(264)
Space and water heating			1013.5740	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	230.6035	0.5190	119.6832	(268)
Total CO2, kg/m2/year			1172.1822	(272)
Emissions per m2 for space and water heating			20.4762	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.4178	(272b)
Emissions per m2 for pumps and fans			0.7864	(272c)
Target Carbon Dioxide Emission Rate (TER) = (20.4762 * 1.00) + 2.4178 + 0.7864, rounded to 2 d.p.			23.6800	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	D-3-02	**Issued on Date**	05/02/2020
Assessment Reference	ASHP - Be Lean	**Prop Type Ref**	2bed 3F
Property			

SAP Rating	80 C	**DER**	22.58	**TER**	21.72
Environmental	85 B	**% DER<TER**	-3.96		
CO_2 Emissions (t/year)	0.98	**DFEE**	61.35	**TFEE**	63.85
General Requirements Compliance	Fail	**% DFEE<TFEE**	3.90		

Assessor Details	Miss Claudia Cioli, Claudia Cioli, Tel: 07481524839, clacioli@gmail.com	**Assessor ID**	R479-0001
Client			

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

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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England
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DWELLING AS DESIGNED

Top-floor flat, total floor area 51 m²

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

1a TER and DER
Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 21.72 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 22.58 kgCO□/m²Fail
Excess emissions =0.86 kgCO□/m² (4.0%)

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)63.8 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)61.4 kWh/m²/yrOK
---
2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	OK
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction
---
3 Air permeability
Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK
---
4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None
---
5 Cylinder insulation
Hot water storage Measured cylinder loss: 0.74 kWh/day
Permitted by DBSCG 0.32 Fail
Primary pipework insulated: No primary pipework
---
6 Controls
Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinderstat

---
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: 94%
Minimum: 70% OK
---
9 Summertime temperature
Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing East: 3.33 m², No overhang
Windows facing South: 12.19 m², No overhang
Air change rate: 0.50 ach
Blinds/curtains: None
---
10 Key features
Party wall U-value 0.00 W/m²K
Air permeability 3.0 m³/m²h

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	51.4000 (1b)	x	2.5500 (2b)	=	131.0700	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.4000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	131.0700	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							0 * 10 =	0.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.0000	
Infiltration rate		0.1500	(18)
Number of sides sheltered		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

If mechanical ventilation:	0.5000	(23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	79.9000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2774	0.2739	0.2705	0.2531	0.2497	0.2323	0.2323	0.2288	0.2393	0.2497	0.2566	0.2635	(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	
W03 (Uw = 1.40)			8.3900	1.3258	11.1231			(27)
W02 (Uw = 1.40)			7.1300	1.3258	9.4527			(27)
door			2.1000	1.4000	2.9400			(26a)
External Wall 1	57.1000	15.5200	41.5800	0.1800	7.4844	140.0000	5821.2000	(29a)
stair wall	13.5000	2.1000	11.4000	0.1800	2.0520	140.0000	1596.0000	(29a)
External Roof 1	51.4000		51.4000	0.1300	6.6820	9.0000	462.6000	(30)
Total net area of external elements Aum(A, m2)			122.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		39.7342			(33)
Party Wall 1			8.4000	0.0000	0.0000	140.0000	1176.0000	(32)
Party Floor 1			51.4000			80.0000	4112.0000	(32d)
Internal Wall			95.0000			9.0000	855.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	14022.8000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		272.8171 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)		19.6885 (36)
Total fabric heat loss	(33) + (36) =	59.4227 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	11.9987	11.8486	11.6986	10.9484	10.7984	10.0482	10.0482	9.8982	10.3483	10.7984	11.0985	11.3985	(38)
Heat transfer coeff	71.4213	71.2713	71.1213	70.3711	70.2211	69.4709	69.4709	69.3209	69.7710	70.2211	70.5211	70.8212	(39)
Average = Sum(39)m / 12 =												70.3336	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3895	1.3866	1.3837	1.3691	1.3662	1.3516	1.3516	1.3487	1.3574	1.3662	1.3720	1.3778	(40)
HLP (average)												1.3684	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.7314 (42)
Average daily hot water use (litres/day)	79.2842 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	87.2127	84.0413	80.8699	77.6986	74.5272	71.3558	71.3558	74.5272	77.6986	80.8699	84.0413	87.2127	(44)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy conte	129.3339	113.1162	116.7258	101.7644	97.6454	84.2605	78.0798	89.5977	90.6677	105.6645	115.3411	125.2529	(45)
Energy content (annual)										Total = Sum(45)m =		1247.4498	(45)
Distribution loss (46)m = 0.15 x (45)m													
	19.4001	16.9674	17.5089	15.2647	14.6468	12.6391	11.7120	13.4396	13.6002	15.8497	17.3012	18.7879	(46)
Water storage loss:													
Store volume												2.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.7400	(48)
Temperature factor from Table 2b												1.0000	(49)
Enter (49) or (54) in (55)												0.7400	(55)
Total storage loss													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(56)
If cylinder contains dedicated solar storage													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(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													
	175.5363	154.8474	162.9282	146.4764	143.8478	128.9725	124.2822	135.8001	135.3797	151.8669	160.0531	171.4553	(62)
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													
	175.5363	154.8474	162.9282	146.4764	143.8478	128.9725	124.2822	135.8001	135.3797	151.8669	160.0531	171.4553	(64)
									Total per year (kWh/year) = Sum(64)m =			1791.4458	(64)
Heat gains from water heating, kWh/month													
	79.9654	70.9961	75.7733	69.6063	69.4290	63.7862	62.9234	66.7531	65.9166	72.0954	74.1205	78.6085	(65)

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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	86.5685	86.5685	86.5685	86.5685	86.5685	86.5685	86.5685	86.5685	86.5685	86.5685	86.5685	86.5685	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	13.4501	11.9463	9.7153	7.3551	5.4981	4.6417	5.0155	6.5193	8.7503	11.1105	12.9675	13.8239	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	150.8691	152.4347	148.4896	140.0908	129.4890	119.5247	112.8679	111.3024	115.2475	123.6462	134.2481	144.2124	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.6568	31.6568	31.6568	31.6568	31.6568	31.6568	31.6568	31.6568	31.6568	31.6568	31.6568	31.6568	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-69.2548	-69.2548	-69.2548	-69.2548	-69.2548	-69.2548	-69.2548	-69.2548	-69.2548	-69.2548	-69.2548	-69.2548	(71)
Water heating gains (Table 5)													
	107.4804	105.6490	101.8458	96.6754	93.3185	88.5920	84.5745	89.7220	91.5509	96.9024	102.9451	105.6566	(72)
Total internal gains													
	320.7702	319.0005	309.0212	293.0919	277.2761	261.7289	251.4285	256.5142	264.5192	280.6296	299.1314	312.6635	(73)

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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	8.3900	46.7521	0.3700	0.8900	0.7700	89.5133	(78)
East	3.3300	19.6403	0.5600	0.6800	0.7700	17.2592	(76)
South	3.8000	46.7521	0.5600	0.6800	0.7700	46.8829	(78)

Solar gains	153.6555	257.1446	340.1513	402.6949	434.5115	424.2517	411.9743	389.2214	361.9129	281.0007	183.1963	132.0521	(83)
Total gains	474.4257	576.1451	649.1726	695.7867	711.7876	685.9806	663.4028	645.7356	626.4320	561.6303	482.3277	444.7155	(84)

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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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	54.5386	54.6534	54.7687	55.3526	55.4709	56.0698	56.0698	56.1912	55.8287	55.4709	55.2348	55.0008	
alpha	4.6359	4.6436	4.6512	4.6902	4.6981	4.7380	4.7380	4.7461	4.7219	4.6981	4.6823	4.6667	
util living area													
	0.9916	0.9793	0.9536	0.8962	0.7872	0.6163	0.4544	0.4849	0.7026	0.9133	0.9813	0.9936	(86)
MIT	19.8172	20.0444	20.3243	20.6255	20.8476	20.9640	20.9930	20.9905	20.9320	20.6427	20.1675	19.7729	(87)
Th 2	19.7714	19.7736	19.7759	19.7871	19.7894	19.8007	19.8007	19.8029	19.7961	19.7894	19.7849	19.7804	(88)
util rest of house													
	0.9886	0.9722	0.9378	0.8615	0.7209	0.5144	0.3339	0.3634	0.6052	0.8765	0.9737	0.9914	(89)
MIT 2	18.2460	18.5740	18.9707	19.3859	19.6571	19.7804	19.7986	19.7999	19.7520	19.4209	18.7628	18.1882	(90)
Living area fraction										fLA = Living area / (4) =		0.4339	(91)
MIT	18.9277	19.2119	19.5579	19.9237	20.1736	20.2939	20.3168	20.3164	20.2640	19.9510	19.3722	18.8757	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9277	19.2119	19.5579	19.9237	20.1736	20.2939	20.3168	20.3164	20.2640	19.9510	19.3722	18.8757	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9858	0.9681	0.9344	0.8659	0.7436	0.5579	0.3865	0.4164	0.6453	0.8822	0.9703	0.9890	(94)
Useful gains	467.6800	557.7437	606.5990	602.4913	529.2740	382.6784	256.3988	268.8962	404.2353	495.4900	467.9875	439.8336	(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													
	1044.7268	1020.0298	928.6975	775.7482	595.0239	395.5584	258.2108	271.4898	430.0652	656.6383	865.4502	1039.3540	(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													
	429.3228	310.6563	239.6413	124.7450	48.9179	0.0000	0.0000	0.0000	0.0000	119.8944	286.1731	446.0432	(98)
Space heating												2005.3940	(98)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Space heating per m2	(98) / (4) =	39.0154 (99)

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1000 (306)
Space heating:	
Annual space heating requirement	2005.3940 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.10	2205.9333 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1791.4458 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.10	1970.5904 (310a)
Electricity used for heat distribution	41.7652 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.2500, SFP = 0.6625)	
mechanical ventilation fans (SFP = 0.6625)	105.9373 (330a)
Total electricity for the above, kWh/year	105.9373 (331)
Electricity for lighting (calculated in Appendix L)	237.5329 (332)
Total delivered energy for all uses	4519.9939 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Boilers			93.9000	(367a)
Space heating from Boilers	4447.8421	0.2160	960.7339	(367)
Electrical energy for heat distribution	41.7652	0.5190	21.6762	(372)
Total CO2 associated with community systems			982.4101	(373)
(negative value allowed since DFEE <= TFEE)				
Space and water heating			982.4101	(376)
Pumps and fans	105.9373	0.5190	54.9815	(378)
Energy for lighting	237.5329	0.5190	123.2796	(379)
Total CO2, kg/year			1160.6711	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			22.5800	(384)

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

DER		22.5800	ZC1
Total Floor Area	TFA	51.4000	
Assumed number of occupants	N	1.7314	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.3934	ZC2
CO2 emissions from cooking, equation (L16)		3.1236	ZC3
Total CO2 emissions		43.0970	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		43.0970	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	51.4000 (1b)	x	2.5500 (2b)	=	131.0700	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.4000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	131.0700	(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)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1526	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.4026	(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) =	0.3724	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4748	0.4655	0.4562	0.4096	0.4003	0.3538	0.3538	0.3445	0.3724	0.4003	0.4189	0.4376	(22b)
Effective ac	0.6127	0.6083	0.6041	0.5839	0.5801	0.5626	0.5626	0.5593	0.5693	0.5801	0.5878	0.5957	(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 Semi-glazed door			2.1000	1.2000	2.5200			(26a)
TER Opening Type (Uw = 1.40)			10.7500	1.3258	14.2519			(27)
External Wall 1	57.1000	10.7500	46.3500	0.1800	8.3430			(29a)
stair wall	13.5000	2.1000	11.4000	0.1800	2.0520			(29a)
External Roof 1	51.4000		51.4000	0.1300	6.6820			(30)
Total net area of external elements Aum(A, m2)			122.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		33.8489			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	16.2370	(36)
Total fabric heat loss (33) + (36) =	50.0859	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.5020	26.3127	26.1271	25.2555	25.0924	24.3333	24.3333	24.1927	24.6257	25.0924	25.4223	25.7672	(38)
Heat transfer coeff	76.5879	76.3986	76.2130	75.3414	75.1783	74.4192	74.4192	74.2786	74.7116	75.1783	75.5082	75.8531	(39)
Average = Sum(39)m / 12 =												75.3406	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4900	1.4864	1.4827	1.4658	1.4626	1.4478	1.4478	1.4451	1.4535	1.4626	1.4690	1.4757	(40)
HLP (average)												1.4658	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.7314 (42)
Average daily hot water use (litres/day)	75.3200 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	82.8520	79.8392	76.8264	73.8136	70.8008	67.7880	67.7880	70.8008	73.8136	76.8264	79.8392	82.8520	(44)
Energy conte	122.8672	107.4604	110.8895	96.6762	92.7631	80.0475	74.1758	85.1178	86.1344	100.3813	109.5740	118.9903	(45)
Energy content (annual)										Total = Sum(45)m =		1185.0773	(45)
Distribution loss (46)m = 0.15 x (45)m	18.4301	16.1191	16.6334	14.5014	13.9145	12.0071	11.1264	12.7677	12.9202	15.0572	16.4361	17.8485	(46)

Water storage loss:	
Store volume	2.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	0.2388 (48)
Temperature factor from Table 2b	0.5400 (49)
Enter (49) or (54) in (55)	0.1290 (55)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss
3.9977 3.6109 3.9977 3.8688 3.9977 3.8688 3.9977 3.9977 3.8688 3.9977 3.8688 3.9977 (56)
If cylinder contains dedicated solar storage
3.9977 3.6109 3.9977 3.8688 3.9977 3.8688 3.9977 3.9977 3.8688 3.9977 3.8688 3.9977 (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
150.1273 132.0825 138.1497 123.0570 120.0232 106.4283 101.4359 112.3779 112.5151 127.6414 135.9548 146.2504 (62)
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
150.1273 132.0825 138.1497 123.0570 120.0232 106.4283 101.4359 112.3779 112.5151 127.6414 135.9548 146.2504 (64)
Total per year (kWh/year) = Sum(64)m = 1506.0435 (64)
Heat gains from water heating, kWh/month
62.6614 55.4282 58.6789 53.2495 52.6518 47.7204 46.4716 50.1098 49.7443 55.1849 57.5380 61.3724 (65)

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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	86.5685	86.5685	86.5685	86.5685	86.5685	86.5685	86.5685	86.5685	86.5685	86.5685	86.5685	86.5685	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
13.4909 11.9825 9.7448 7.3775 5.5147 4.6558 5.0307 6.5391 8.7768 11.1442 13.0069 13.8659 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
150.8691 152.4347 148.4896 140.0908 129.4890 119.5247 112.8679 111.3024 115.2475 123.6462 134.2481 144.2124 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
31.6568 31.6568 31.6568 31.6568 31.6568 31.6568 31.6568 31.6568 31.6568 31.6568 31.6568 31.6568 (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)
-69.2548 -69.2548 -69.2548 -69.2548 -69.2548 -69.2548 -69.2548 -69.2548 -69.2548 -69.2548 -69.2548 -69.2548 (71)
Water heating gains (Table 5)
84.2224 82.4825 78.8695 73.9576 70.7686 66.2784 62.4618 67.3518 69.0893 74.1732 79.9139 82.4898 (72)
Total internal gains
300.5530 298.8703 289.0744 273.3964 257.7429 242.4294 232.3310 237.1639 245.0842 260.9342 279.1395 292.5386 (73)

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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	2.3100	19.6403	0.6300	0.7000	0.7700	13.8654	(76)
South	8.4400	46.7521	0.6300	0.7000	0.7700	120.5910	(78)

Solar gains	134.4564	224.6206	296.2449	349.4824	376.1350	366.8741	356.4134	337.4001	314.7526	245.2035	160.2300	115.6040	(83)
Total gains	435.0094	523.4909	585.3193	622.8788	633.8779	609.3035	588.7444	574.5640	559.8368	506.1378	439.3695	408.1426	(84)

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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	46.6058	46.7213	46.8351	47.3769	47.4797	47.9640	47.9640	48.0548	47.7763	47.4797	47.2723	47.0573	
alpha	4.1071	4.1148	4.1223	4.1585	4.1653	4.1976	4.1976	4.2037	4.1851	4.1653	4.1515	4.1372	
util living area	0.9921	0.9827	0.9644	0.9244	0.8438	0.6976	0.5341	0.5656	0.7725	0.9355	0.9842	0.9939	(86)
MIT	19.5419	19.7680	20.0686	20.4198	20.7159	20.9112	20.9775	20.9710	20.8562	20.4670	19.9343	19.5017	(87)
Th 2	19.6950	19.6977	19.7005	19.7133	19.7157	19.7268	19.7268	19.7289	19.7225	19.7157	19.7108	19.7057	(88)
util rest of house	0.9894	0.9770	0.9522	0.8971	0.7855	0.5902	0.3903	0.4232	0.6776	0.9065	0.9779	0.9918	(89)
MIT 2	17.8083	18.1366	18.5682	19.0658	19.4505	19.6712	19.7195	19.7185	19.6193	19.1421	18.3891	17.7571	(90)
Living area fraction									fLA = Living area / (4) =			0.4339	(91)
MIT	18.5604	18.8444	19.2192	19.6532	19.9995	20.2092	20.2653	20.2619	20.1559	19.7169	19.0595	18.5140	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5604	18.8444	19.2192	19.6532	19.9995	20.2092	20.2653	20.2619	20.1559	19.7169	19.0595	18.5140	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9862	0.9719	0.9464	0.8956	0.8000	0.6338	0.4533	0.4854	0.7131	0.9065	0.9736	0.9890	(94)
Useful gains	428.9857	508.7947	553.9737	557.8700	507.0898	386.1825	266.8658	278.8945	399.2082	458.8118	427.7503	403.6659	(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	1092.1765	1065.3307	969.3684	810.1605	623.9452	417.4322	272.7678	286.8561	452.4491	685.3951	903.0411	1085.7582	(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	493.4140	373.9922	309.0537	181.6491	86.9404	0.0000	0.0000	0.0000	0.0000	168.5780	342.2094	507.4767	(98)
Space heating												2463.3134	(98)
Space heating per m2											(98) / (4) =	47.9244	(99)

8c. Space cooling requirement

Not applicable

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												2634.5598	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	493.4140	373.9922	309.0537	181.6491	86.9404	0.0000	0.0000	0.0000	0.0000	168.5780	342.2094	507.4767	(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)	527.7155	399.9917	330.5387	194.2772	92.9844	0.0000	0.0000	0.0000	0.0000	180.2973	365.9993	542.7558	(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	150.1273	132.0825	138.1497	123.0570	120.0232	106.4283	101.4359	112.3779	112.5151	127.6414	135.9548	146.2504	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.7550	87.4400	86.9005	85.8511	83.9705	79.8000	79.8000	79.8000	79.8000	85.5567	87.1765	87.8643	(217)
Fuel for water heating, kWh/month	171.0754	151.0550	158.9746	143.3377	142.9350	133.3688	127.1127	140.8245	140.9964	149.1892	155.9535	166.4503	(219)
Water heating fuel used												1781.2730	(219)
Annual totals kWh/year													
Space heating fuel - main system												2634.5598	(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)												238.2541	(232)
Total delivered energy for all uses												4729.0870	(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	2634.5598	0.2160	569.0649	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1781.2730	0.2160	384.7550	(264)
Space and water heating			953.8199	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	238.2541	0.5190	123.6539	(268)
Total CO2, kg/m2/year			1116.3988	(272)
Emissions per m2 for space and water heating			18.5568	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.4057	(272b)
Emissions per m2 for pumps and fans			0.7573	(272c)
Target Carbon Dioxide Emission Rate (TER) = (18.5568 * 1.00) + 2.4057 + 0.7573, rounded to 2 d.p.			21.7200	(273)

APPENDIX B2 - SAP OUTPUTS FOR SAMPLE UNITS "GREEN"

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	A-0-01	**Issued on Date**	05/02/2020
Assessment Reference	ASHP 46%	**Prop Type Ref**	2bed 3F
Property			

SAP Rating	87 B	**DER**	10.98	**TER**	16.84
Environmental	92 A	**% DER<TER**	34.80		
CO_2 Emissions (t/year)	0.62	**DFEE**	44.76	**TFEE**	47.91
General Requirements Compliance	Fail	**% DFEE<TFEE**	6.57		

Assessor Details	Miss Claudia Cioli, Claudia Cioli, Tel: 07481524839, clacioli@gmail.com	**Assessor ID**	R479-0001
Client			

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

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DWELLING AS DESIGNED

Ground-floor flat, total floor area 74 m²

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

1a TER and DER
Fuels for main heating:Mains gas (c), Electricity (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 16.84 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 10.98 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)47.9 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)44.8 kWh/m²/yrOK

---
2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.11 (max. 0.25)	0.11 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction

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

---
4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage Measured cylinder loss: 0.74 kWh/day
Permitted by DBSCG 0.32 Fail
Primary pipework insulated: No primary pipework

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

Hot water controls: No cylinderstat

---
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: 94%
Minimum: 70% OK

---
9 Summertime temperature
Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing North East: 3.35 m², No overhang
Windows facing West: 15.10 m², Overhang width less than twice window, ratio 1.00
Air change rate: 0.50 ach
Blinds/curtains: None

---
10 Key features
Party wall U-value 0.00 W/m²K
Floor U-value 0.11 W/m²K
Air permeability 3.0 m³/m²h
Photovoltaic array 0.49 kW

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	74.0000 (1b)	x	2.5400 (2b)	=	187.9600	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	187.9600	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							0 * 10 =	0.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.0000	
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	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) =	79.9000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2631	0.2599	0.2567	0.2408	0.2376	0.2216	0.2216	0.2184	0.2280	0.2376	0.2439	0.2503	(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	
W03 (Uw = 1.40)			8.4000	1.3258	11.1364			(27)
door			2.1000	1.4000	2.9400			(26a)
W01 (Uw = 1.40)			10.0500	1.3258	13.3239			(27)
Heat Loss Floor 1			74.0000	0.1100	8.1400	110.0000	8140.0000	(28a)
External Wall 1	49.5300	20.5500	28.9800	0.1500	4.3470	140.0000	4057.2000	(29a)
Total net area of external elements Aum(A, m2)			123.5300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.8872			(33)
Party Wall 1			42.5000	0.0000	0.0000	140.0000	5950.0000	(32)
Party Ceilings			74.0000			80.0000	5920.0000	(32b)
Internal Wall			132.0000			9.0000	1188.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	25255.2000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		341.2865 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)		7.7649 (36)
Total fabric heat loss	(33) + (36) =	47.6521 (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	16.3169	16.1192	15.9215	14.9330	14.7352	13.7467	13.7467	13.5490	14.1421	14.7352	15.1307	15.5261	(38)
Heat transfer coeff	63.9691	63.7713	63.5736	62.5851	62.3874	61.3988	61.3988	61.2011	61.7942	62.3874	62.7828	63.1782	(39)
Average = Sum(39)m / 12 =												62.5357	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8644	0.8618	0.8591	0.8457	0.8431	0.8297	0.8297	0.8270	0.8351	0.8431	0.8484	0.8538	(40)
HLP (average)												0.8451	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.3392 (42)
Average daily hot water use (litres/day)	94.4799 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	103.9278	100.1486	96.3694	92.5903	88.8111	85.0319	85.0319	88.8111	92.5903	96.3694	100.1486	103.9278	(44)
Energy conte	154.1220	134.7961	139.0975	121.2685	116.3601	100.4099	93.0445	106.7699	108.0451	125.9162	137.4473	149.2589	(45)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy content (annual)												Total = Sum(45)m =	1486.5360 (45)
Distribution loss (46)m = 0.15 x (45)m													
	23.1183	20.2194	20.8646	18.1903	17.4540	15.0615	13.9567	16.0155	16.2068	18.8874	20.6171	22.3888	(46)
Water storage loss:													
Store volume													2.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													0.7400 (48)
Temperature factor from Table 2b													1.0000 (49)
Enter (49) or (54) in (55)													0.7400 (55)
Total storage loss													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(56)
If cylinder contains dedicated solar storage													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	200.3244	176.5273	185.2999	165.9805	162.5625	145.1219	139.2469	152.9723	152.7571	172.1186	182.1593	195.4613	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
											Solar input (sum of months) = Sum(63)m =		0.0000 (63)
Output from w/h													
	200.3244	176.5273	185.2999	165.9805	162.5625	145.1219	139.2469	152.9723	152.7571	172.1186	182.1593	195.4613	(64)
											Total per year (kWh/year) = Sum(64)m =		2030.5320 (64)
Heat gains from water heating, kWh/month													
	88.2075	78.2047	83.2118	76.0914	75.6516	69.1559	67.8992	72.4629	71.6946	78.8290	81.4708	86.5905	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	18.4049	16.3471	13.2943	10.0647	7.5235	6.3516	6.8632	8.9210	11.9737	15.2034	17.7446	18.9165	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	206.4473	208.5895	203.1911	191.6984	177.1909	163.5559	154.4469	152.3047	157.7031	169.1958	183.7033	197.3383	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	(71)
Water heating gains (Table 5)													
	118.5584	116.3760	111.8439	105.6825	101.6823	96.0498	91.2624	97.3964	99.5758	105.9530	113.1539	116.3851	(72)
Total internal gains													
	401.4985	399.4005	386.4172	365.5335	344.4846	324.0453	310.6604	316.7100	327.3406	348.4402	372.6898	390.7277	(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	8.4000	19.6403	0.3700	0.8900	0.7700	37.6488	(80)
Northeast	3.5000	11.2829	0.3700	0.6500	0.7700	6.2996	(75)
West	6.7000	19.6403	0.3700	0.6500	0.7700	21.9316	(80)

Solar gains	65.8801	129.3751	215.0477	317.8816	394.0780	405.5728	385.2214	327.7574	251.3909	153.9696	82.2164	54.1407	(83)
Total gains	467.3786	528.7756	601.4648	683.4151	738.5626	729.6182	695.8818	644.4673	578.7315	502.4097	454.9061	444.8684	(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	109.6676	110.0076	110.3497	112.0927	112.4480	114.2584	114.2584	114.6276	113.5273	112.4480	111.7398	111.0404	
alpha	8.3112	8.3338	8.3566	8.4728	8.4965	8.6172	8.6172	8.6418	8.5685	8.4965	8.4493	8.4027	
util living area													
	0.9994	0.9981	0.9900	0.9342	0.7615	0.5374	0.3882	0.4366	0.7218	0.9718	0.9980	0.9996	(86)
MIT	20.3830	20.4877	20.6648	20.8777	20.9817	20.9991	21.0000	20.9999	20.9911	20.8347	20.5693	20.3661	(87)
Th 2	20.1978	20.2001	20.2024	20.2139	20.2162	20.2277	20.2277	20.2300	20.2231	20.2162	20.2116	20.2070	(88)
util rest of house													
	0.9992	0.9972	0.9855	0.9096	0.7065	0.4732	0.3201	0.3637	0.6478	0.9558	0.9970	0.9994	(89)
MIT 2	19.3711	19.5258	19.7837	20.0835	20.2018	20.2272	20.2276	20.2299	20.2178	20.0356	19.6546	19.3539	(90)
Living area fraction									fLA = Living area / (4) =			0.3405	(91)
MIT	19.7157	19.8534	20.0837	20.3540	20.4674	20.4901	20.4906	20.4921	20.4811	20.3077	19.9661	19.6986	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7157	19.8534	20.0837	20.3540	20.4674	20.4901	20.4906	20.4921	20.4811	20.3077	19.9661	19.6986	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9989	0.9967	0.9847	0.9145	0.7247	0.4951	0.3433	0.3885	0.6730	0.9581	0.9966	0.9993	(94)
Useful gains	466.8819	527.0392	592.2678	624.9806	535.2354	361.2121	238.8654	250.3989	389.5016	481.3338	453.3459	444.5474	(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													
	986.1293	953.5985	863.5678	716.8495	546.9752	361.6434	238.8810	250.4423	394.3163	605.6402	807.7716	979.1719	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	386.3200	286.6478	201.8473	66.1456	8.7344	0.0000	0.0000	0.0000	0.0000	92.4840	255.1865	397.7606	(98)
Space heating												1695.1262	(98)
Space heating per m2											(98) / (4) =	22.9071	(99)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)		0.0000 (301)
Fraction of space heat from community system		1.0000 (302)
Fraction of heat from community Heat pump		0.4600 (303a)
Fraction of heat from community Boilers		0.5400 (303b)
Fraction of total space heat from community Heat pump		0.4600 (304a)
Fraction of total space heat from community Boilers		0.5400 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating		1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating		1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system		1.0500 (306)
Space heating:		
Annual space heating requirement		1695.1262 (98)
Space heat from Heat pump = (98) x 0.46 x 1.00 x 1.05		818.7459 (307a)
Space heat from Boilers = (98) x 0.54 x 1.00 x 1.05		961.1365 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0.0000 (308)
Space heating fuel for secondary/supplementary system		0.0000 (309)
Water heating		
Annual water heating requirement		2030.5320 (64)
Water heat from Heat pump = (64) x 0.46 x 1.00 x 1.05		980.7469 (310a)
Water heat from Boilers = (64) x 0.54 x 1.00 x 1.05		1151.3116 (310b)
Electricity used for heat distribution		39.1194 (313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.2500, SFP = 0.6625)		
mechanical ventilation fans (SFP = 0.6625)		151.9187 (330a)
Total electricity for the above, kWh/year		151.9187 (331)
Electricity for lighting (calculated in Appendix L)		325.0367 (332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV Unit 0 (0.80 * 0.49 * 951 * 1.00) =	-372.6415	-372.6415 (333)
Total delivered energy for all uses		4016.2550 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			370.0000	(367a)
Space heating from Heat pump	486.3494	0.5190	252.4154	(367)
Efficiency of heat source Boilers			93.9000	(367b)
Space heating from Boilers	2249.6786	0.2160	485.9306	(368)
Electrical energy for heat distribution	39.1194	0.5190	20.3030	(372)
Total CO2 associated with community systems			758.6489	(373)
(negative value allowed since DFEE <= TFEE)				
Space and water heating			758.6489	(376)
Pumps and fans	151.9187	0.5190	78.8458	(378)
Energy for lighting	325.0367	0.5190	168.6941	(379)
Energy saving/generation technologies				
PV Unit	-372.6415	0.5190	-193.4009	(380)
Total CO2, kg/year			812.7878	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			10.9800	(384)

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

DER		10.9800	ZC1
Total Floor Area	TFA	74.0000	
Assumed number of occupants	N	2.3392	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.5319	ZC2
CO2 emissions from cooking, equation (L16)		2.3668	ZC3
Total CO2 emissions		29.8787	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		29.8787	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	74.0000 (1b)	x	2.5400 (2b)	=	187.9600	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	187.9600	(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							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) =	0.1596	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.4096	(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) =	0.3482	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4439	0.4352	0.4265	0.3830	0.3743	0.3308	0.3308	0.3221	0.3482	0.3743	0.3917	0.4091	(22b)
Effective ac	0.5985	0.5947	0.5910	0.5733	0.5700	0.5547	0.5547	0.5519	0.5606	0.5700	0.5767	0.5837	(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 Semi-glazed door			2.1000	1.2000	2.5200			(26a)
TER Opening Type (Uw = 1.40)			16.4100	1.3258	21.7557			(27)
Heat Loss Floor 1			74.0000	0.1300	9.6200			(28a)
External Wall 1	49.5300	18.5100	31.0200	0.1800	5.5836			(29a)
Total net area of external elements Aum(A, m2)			123.5300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.4793			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.5349	(36)
Total fabric heat loss					(33) + (36) =		45.0142	(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	37.1249	36.8875	36.6549	35.5623	35.3579	34.4063	34.4063	34.2301	34.7729	35.3579	35.7715	36.2038	(38)
Heat transfer coeff	82.1390	81.9017	81.6691	80.5765	80.3721	79.4205	79.4205	79.2443	79.7870	80.3721	80.7856	81.2180	(39)
Average = Sum(39)m / 12 =												80.5755	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1100	1.1068	1.1036	1.0889	1.0861	1.0732	1.0732	1.0709	1.0782	1.0861	1.0917	1.0975	(40)
HLP (average)												1.0889	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3392	(42)
Average daily hot water use (litres/day)												89.7559	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	98.7314	95.1412	91.5510	87.9607	84.3705	80.7803	80.7803	84.3705	87.9607	91.5510	95.1412	98.7314	(44)
Energy conte	146.4159	128.0563	132.1426	115.2051	110.5421	95.3894	88.3923	101.4314	102.6429	119.6204	130.5750	141.7960	(45)
Energy content (annual)										Total = Sum(45)m =		1412.2092	(45)
Distribution loss (46)m = 0.15 x (45)m	21.9624	19.2084	19.8214	17.2808	16.5813	14.3084	13.2588	15.2147	15.3964	17.9431	19.5862	21.2694	(46)
Water storage loss:													
Store volume												2.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.2388	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.1290	(55)
Total storage loss													

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

	3.9977	3.6109	3.9977	3.8688	3.9977	3.8688	3.9977	3.9977	3.8688	3.9977	3.8688	3.9977	(56)
If cylinder contains dedicated solar storage													
	3.9977	3.6109	3.9977	3.8688	3.9977	3.8688	3.9977	3.9977	3.8688	3.9977	3.8688	3.9977	(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													
	173.6760	152.6783	159.4027	141.5859	137.8022	121.7702	115.6524	128.6916	129.0236	146.8805	156.9558	169.0561	(62)
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													
	173.6760	152.6783	159.4027	141.5859	137.8022	121.7702	115.6524	128.6916	129.0236	146.8805	156.9558	169.0561	(64)
								Total per year (kWh/year) = Sum(64)m =				1733.1754	(64)
Heat gains from water heating, kWh/month													
	70.4914	62.2764	65.7455	59.4103	58.5633	52.8216	51.1986	55.5341	55.2334	61.5819	64.5208	68.9553	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	18.4071	16.3490	13.2959	10.0659	7.5244	6.3524	6.8640	8.9221	11.9752	15.2052	17.7467	18.9187	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	206.4473	208.5895	203.1911	191.6984	177.1909	163.5559	154.4469	152.3047	157.7031	169.1958	183.7033	197.3383	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	(71)
Water heating gains (Table 5)													
	94.7465	92.6732	88.3676	82.5143	78.7142	73.3633	68.8153	74.6426	76.7130	82.7713	89.6122	92.6818	(72)
Total internal gains													
	380.6888	378.6997	365.9426	345.3665	324.5174	304.3596	291.2141	296.9572	307.4792	328.2603	352.1502	370.0267	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	2.9800	11.2829	0.6300	0.7000	0.7700	10.2757	(75)
West	13.4300	19.6403	0.6300	0.7000	0.7700	80.6112	(80)

Solar gains	90.8868	178.6090	297.3819	440.6420	547.3670	563.8571	535.3462	454.7292	347.9580	212.6770	113.4421	74.6823	(83)
Total gains	471.5756	557.3086	663.3245	786.0085	871.8843	868.2167	826.5602	751.6864	655.4372	540.9373	465.5923	444.7090	(84)

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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	62.5633	62.7446	62.9233	63.7765	63.9387	64.7048	64.7048	64.8487	64.4076	63.9387	63.6114	63.2728	
alpha	5.1709	5.1830	5.1949	5.2518	5.2626	5.3137	5.3137	5.3232	5.2938	5.2626	5.2408	5.2182	
util living area													
	0.9974	0.9933	0.9777	0.9155	0.7694	0.5708	0.4202	0.4796	0.7598	0.9618	0.9942	0.9981	(86)
MIT	19.8476	20.0214	20.3144	20.6722	20.9016	20.9837	20.9973	20.9948	20.9325	20.5947	20.1533	19.8203	(87)
Th 2	19.9927	19.9953	19.9979	20.0099	20.0122	20.0227	20.0227	20.0247	20.0187	20.0122	20.0076	20.0028	(88)
util rest of house													
	0.9965	0.9911	0.9703	0.8893	0.7119	0.4899	0.3283	0.3807	0.6798	0.9444	0.9919	0.9974	(89)
MIT 2	18.4590	18.7138	19.1378	19.6412	19.9230	20.0128	20.0218	20.0227	19.9685	19.5503	18.9161	18.4265	(90)
Living area fraction									fLA = Living area / (4) =			0.3405	(91)
MIT	18.9319	19.1591	19.5385	19.9923	20.2563	20.3434	20.3540	20.3537	20.2967	19.9060	19.3375	18.9012	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9319	19.1591	19.5385	19.9923	20.2563	20.3434	20.3540	20.3537	20.2967	19.9060	19.3375	18.9012	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9952	0.9886	0.9659	0.8888	0.7270	0.5171	0.3597	0.4145	0.7042	0.9421	0.9897	0.9964	(94)
Useful gains	469.2973	550.9451	640.7266	698.5949	633.8343	448.9376	297.2982	311.5720	461.5349	509.6110	460.7879	443.0931	(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													
	1201.8494	1167.8433	1064.8433	893.7774	687.6842	456.1431	298.1449	313.3112	494.4197	747.9389	988.6105	1193.9990	(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													
	545.0187	414.5556	315.5428	140.5314	40.0644	0.0000	0.0000	0.0000	0.0000	177.3160	380.0323	558.6740	(98)
Space heating												2571.7350	(98)
Space heating per m2										(98) / (4) =		34.7532	(99)

8c. Space cooling requirement

Not applicable

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												2750.5188	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	545.0187	414.5556	315.5428	140.5314	40.0644	0.0000	0.0000	0.0000	0.0000	177.3160	380.0323	558.6740	(98)
Space heating efficiency (main heating system 1)													
	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000		(210)
Space heating fuel (main heating system)													
	582.9077	443.3749	337.4789	150.3010	42.8496	0.0000	0.0000	0.0000	0.0000	189.6428	406.4516	597.5123	(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													
	173.6760	152.6783	159.4027	141.5859	137.8022	121.7702	115.6524	128.6916	129.0236	146.8805	156.9558	169.0561	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.6596	87.3476	86.6027	84.7939	81.9834	79.8000	79.8000	79.8000	79.8000	85.3171	87.0869	87.7662	(217)
Fuel for water heating, kWh/month													
	198.1255	174.7940	184.0621	166.9764	168.0856	152.5942	144.9279	161.2677	161.6838	172.1583	180.2289	192.6210	(219)
Water heating fuel used												2057.5253	(219)
Annual totals kWh/year													
Space heating fuel - main system												2750.5188	(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)												325.0756	(232)
Total delivered energy for all uses												5208.1196	(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	2750.5188	0.2160	594.1121	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2057.5253	0.2160	444.4255	(264)
Space and water heating			1038.5375	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	325.0756	0.5190	168.7142	(268)
Total CO2, kg/m2/year			1246.1767	(272)
Emissions per m2 for space and water heating			14.0343	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.2799	(272b)
Emissions per m2 for pumps and fans			0.5260	(272c)
Target Carbon Dioxide Emission Rate (TER) = (14.0343 * 1.00) + 2.2799 + 0.5260, rounded to 2 d.p.			16.8400	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	A-0-02	**Issued on Date**	05/02/2020
Assessment Reference	ASHP 46%	**Prop Type Ref**	2bed 3F
Property			

SAP Rating	87 B	**DER**	10.98	**TER**	16.84
Environmental	92 A	**% DER<TER**	34.80		
CO_2 Emissions (t/year)	0.62	**DFEE**	44.76	**TFEE**	47.91
General Requirements Compliance	Fail	**% DFEE<TFEE**	6.57		

Assessor Details	Miss Claudia Cioli, Claudia Cioli, Tel: 07481524839, clacioli@gmail.com	**Assessor ID**	R479-0001
Client			

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

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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England
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DWELLING AS DESIGNED

Ground-floor flat, total floor area 74 m²

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

1a TER and DER
Fuels for main heating:Mains gas (c), Electricity (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 16.84 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 10.98 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)47.9 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)44.8 kWh/m²/yrOK

---
2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.11 (max. 0.25)	0.11 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction

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

---
4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage Measured cylinder loss: 0.74 kWh/day
Permitted by DBSCG 0.32 Fail
Primary pipework insulated: No primary pipework

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

Hot water controls: No cylinderstat

---
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: 94%
Minimum: 70% OK

---
9 Summertime temperature
Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing North East: 3.35 m², No overhang
Windows facing East: 15.10 m², Overhang width less than twice window, ratio 1.00
Air change rate: 0.50 ach
Blinds/curtains: None

---
10 Key features
Party wall U-value 0.00 W/m²K
Floor U-value 0.11 W/m²K
Air permeability 3.0 m³/m²h
Photovoltaic array 0.49 kW

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	74.0000 (1b)	x	2.5400 (2b)	=	187.9600	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	187.9600	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							0 * 10 =	0.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.0000	
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	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) =	79.9000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2631	0.2599	0.2567	0.2408	0.2376	0.2216	0.2216	0.2184	0.2280	0.2376	0.2439	0.2503	(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	
W03 (Uw = 1.40)			8.4000	1.3258	11.1364			(27)
door			2.1000	1.4000	2.9400			(26a)
W01 (Uw = 1.40)			10.0500	1.3258	13.3239			(27)
Heat Loss Floor 1			74.0000	0.1100	8.1400	110.0000	8140.0000	(28a)
External Wall 1	49.5300	20.5500	28.9800	0.1500	4.3470	140.0000	4057.2000	(29a)
Total net area of external elements Aum(A, m2)			123.5300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.8872			(33)
Party Wall 1			42.5000	0.0000	0.0000	140.0000	5950.0000	(32)
Party Ceilings			74.0000			80.0000	5920.0000	(32b)
Internal Wall			132.0000			9.0000	1188.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	25255.2000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		341.2865 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)		7.7649 (36)
Total fabric heat loss	(33) + (36) =	47.6521 (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	16.3169	16.1192	15.9215	14.9330	14.7352	13.7467	13.7467	13.5490	14.1421	14.7352	15.1307	15.5261	(38)
Heat transfer coeff	63.9691	63.7713	63.5736	62.5851	62.3874	61.3988	61.3988	61.2011	61.7942	62.3874	62.7828	63.1782	(39)
Average = Sum(39)m / 12 =												62.5357	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8644	0.8618	0.8591	0.8457	0.8431	0.8297	0.8297	0.8270	0.8351	0.8431	0.8484	0.8538	(40)
HLP (average)												0.8451	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.3392 (42)
Average daily hot water use (litres/day)	94.4799 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	103.9278	100.1486	96.3694	92.5903	88.8111	85.0319	85.0319	88.8111	92.5903	96.3694	100.1486	103.9278	(44)
Energy conte	154.1220	134.7961	139.0975	121.2685	116.3601	100.4099	93.0445	106.7699	108.0451	125.9162	137.4473	149.2589	(45)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy content (annual)												Total = Sum(45)m =	1486.5360 (45)
Distribution loss (46)m = 0.15 x (45)m													
	23.1183	20.2194	20.8646	18.1903	17.4540	15.0615	13.9567	16.0155	16.2068	18.8874	20.6171	22.3888	(46)
Water storage loss:													
Store volume													2.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													0.7400 (48)
Temperature factor from Table 2b													1.0000 (49)
Enter (49) or (54) in (55)													0.7400 (55)
Total storage loss													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(56)
If cylinder contains dedicated solar storage													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	200.3244	176.5273	185.2999	165.9805	162.5625	145.1219	139.2469	152.9723	152.7571	172.1186	182.1593	195.4613	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
											Solar input (sum of months) = Sum(63)m =		0.0000 (63)
Output from w/h													
	200.3244	176.5273	185.2999	165.9805	162.5625	145.1219	139.2469	152.9723	152.7571	172.1186	182.1593	195.4613	(64)
											Total per year (kWh/year) = Sum(64)m =		2030.5320 (64)
Heat gains from water heating, kWh/month													
	88.2075	78.2047	83.2118	76.0914	75.6516	69.1559	67.8992	72.4629	71.6946	78.8290	81.4708	86.5905	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	18.4049	16.3471	13.2943	10.0647	7.5235	6.3516	6.8632	8.9210	11.9737	15.2034	17.7446	18.9165	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	206.4473	208.5895	203.1911	191.6984	177.1909	163.5559	154.4469	152.3047	157.7031	169.1958	183.7033	197.3383	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	(71)
Water heating gains (Table 5)													
	118.5584	116.3760	111.8439	105.6825	101.6823	96.0498	91.2624	97.3964	99.5758	105.9530	113.1539	116.3851	(72)
Total internal gains													
	401.4985	399.4005	386.4172	365.5335	344.4846	324.0453	310.6604	316.7100	327.3406	348.4402	372.6898	390.7277	(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	8.4000	19.6403	0.3700	0.8900	0.7700	37.6488	(76)
Northeast	3.3500	11.2829	0.3700	0.6500	0.7700	6.2996	(75)
East	6.7000	19.6403	0.3700	0.6500	0.7700	21.9316	(76)

Solar gains	65.8801	129.3751	215.0477	317.8816	394.0780	405.5728	385.2214	327.7574	251.3909	153.9696	82.2164	54.1407	(83)
Total gains	467.3786	528.7756	601.4648	683.4151	738.5626	729.6182	695.8818	644.4673	578.7315	502.4097	454.9061	444.8684	(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	109.6676	110.0076	110.3497	112.0927	112.4480	114.2584	114.2584	114.6276	113.5273	112.4480	111.7398	111.0404	
alpha	8.3112	8.3338	8.3566	8.4728	8.4965	8.6172	8.6172	8.6418	8.5685	8.4965	8.4493	8.4027	
util living area													
	0.9994	0.9981	0.9900	0.9342	0.7615	0.5374	0.3882	0.4366	0.7218	0.9718	0.9980	0.9996	(86)
MIT	20.3830	20.4877	20.6648	20.8777	20.9817	20.9991	21.0000	20.9999	20.9911	20.8347	20.5693	20.3661	(87)
Th 2	20.1978	20.2001	20.2024	20.2139	20.2162	20.2277	20.2277	20.2300	20.2231	20.2162	20.2116	20.2070	(88)
util rest of house													
	0.9992	0.9972	0.9855	0.9096	0.7065	0.4732	0.3201	0.3637	0.6478	0.9558	0.9970	0.9994	(89)
MIT 2	19.3711	19.5258	19.7837	20.0835	20.2018	20.2272	20.2276	20.2299	20.2178	20.0356	19.6546	19.3539	(90)
Living area fraction										fLA = Living area / (4) =		0.3405	(91)
MIT	19.7157	19.8534	20.0837	20.3540	20.4674	20.4901	20.4906	20.4921	20.4811	20.3077	19.9661	19.6986	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7157	19.8534	20.0837	20.3540	20.4674	20.4901	20.4906	20.4921	20.4811	20.3077	19.9661	19.6986	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9989	0.9967	0.9847	0.9145	0.7247	0.4951	0.3433	0.3885	0.6730	0.9581	0.9966	0.9993	(94)
Useful gains	466.8819	527.0392	592.2678	624.9806	535.2354	361.2121	238.8654	250.3989	389.5016	481.3338	453.3459	444.5474	(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													
	986.1293	953.5985	863.5678	716.8495	546.9752	361.6434	238.8810	250.4423	394.3163	605.6402	807.7716	979.1719	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	386.3200	286.6478	201.8473	66.1456	8.7344	0.0000	0.0000	0.0000	0.0000	92.4840	255.1865	397.7606	(98)
Space heating												1695.1262	(98)
Space heating per m2											(98) / (4) =	22.9071	(99)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)		0.0000 (301)
Fraction of space heat from community system		1.0000 (302)
Fraction of heat from community Heat pump		0.4600 (303a)
Fraction of heat from community Boilers		0.5400 (303b)
Fraction of total space heat from community Heat pump		0.4600 (304a)
Fraction of total space heat from community Boilers		0.5400 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating		1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating		1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system		1.0500 (306)
Space heating:		
Annual space heating requirement		1695.1262 (98)
Space heat from Heat pump = (98) x 0.46 x 1.00 x 1.05		818.7459 (307a)
Space heat from Boilers = (98) x 0.54 x 1.00 x 1.05		961.1365 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0.0000 (308)
Space heating fuel for secondary/supplementary system		0.0000 (309)
Water heating		
Annual water heating requirement		2030.5320 (64)
Water heat from Heat pump = (64) x 0.46 x 1.00 x 1.05		980.7469 (310a)
Water heat from Boilers = (64) x 0.54 x 1.00 x 1.05		1151.3116 (310b)
Electricity used for heat distribution		39.1194 (313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.2500, SFP = 0.6625)		
mechanical ventilation fans (SFP = 0.6625)		151.9187 (330a)
Total electricity for the above, kWh/year		151.9187 (331)
Electricity for lighting (calculated in Appendix L)		325.0367 (332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV Unit 0 (0.80 * 0.49 * 951 * 1.00) =	-372.6415	-372.6415 (333)
Total delivered energy for all uses		4016.2550 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			370.0000	(367a)
Space heating from Heat pump	486.3494	0.5190	252.4154	(367)
Efficiency of heat source Boilers			93.9000	(367b)
Space heating from Boilers	2249.6786	0.2160	485.9306	(368)
Electrical energy for heat distribution	39.1194	0.5190	20.3030	(372)
Total CO2 associated with community systems			758.6489	(373)
(negative value allowed since DFEE <= TFEE)				
Space and water heating			758.6489	(376)
Pumps and fans	151.9187	0.5190	78.8458	(378)
Energy for lighting	325.0367	0.5190	168.6941	(379)
Energy saving/generation technologies				
PV Unit	-372.6415	0.5190	-193.4009	(380)
Total CO2, kg/year			812.7878	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			10.9800	(384)

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

DER		10.9800	ZC1
Total Floor Area	TFA	74.0000	
Assumed number of occupants	N	2.3392	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.5319	ZC2
CO2 emissions from cooking, equation (L16)		2.3668	ZC3
Total CO2 emissions		29.8787	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		29.8787	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	74.0000 (1b)	x	2.5400 (2b)	=	187.9600	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	187.9600	(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							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) =	0.1596	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.4096	(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) =	0.3482	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4439	0.4352	0.4265	0.3830	0.3743	0.3308	0.3308	0.3221	0.3482	0.3743	0.3917	0.4091	(22b)
Effective ac	0.5985	0.5947	0.5910	0.5733	0.5700	0.5547	0.5547	0.5519	0.5606	0.5700	0.5767	0.5837	(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 Semi-glazed door			2.1000	1.2000	2.5200			(26a)
TER Opening Type (Uw = 1.40)			16.4100	1.3258	21.7557			(27)
Heat Loss Floor 1			74.0000	0.1300	9.6200			(28a)
External Wall 1	49.5300	18.5100	31.0200	0.1800	5.5836			(29a)
Total net area of external elements Aum(A, m2)			123.5300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.4793			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.5349	(36)
Total fabric heat loss					(33) + (36) =		45.0142	(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	37.1249	36.8875	36.6549	35.5623	35.3579	34.4063	34.4063	34.2301	34.7729	35.3579	35.7715	36.2038	(38)
Heat transfer coeff	82.1390	81.9017	81.6691	80.5765	80.3721	79.4205	79.4205	79.2443	79.7870	80.3721	80.7856	81.2180	(39)
Average = Sum(39)m / 12 =												80.5755	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1100	1.1068	1.1036	1.0889	1.0861	1.0732	1.0732	1.0709	1.0782	1.0861	1.0917	1.0975	(40)
HLP (average)												1.0889	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3392	(42)
Average daily hot water use (litres/day)												89.7559	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	98.7314	95.1412	91.5510	87.9607	84.3705	80.7803	80.7803	84.3705	87.9607	91.5510	95.1412	98.7314	(44)
Energy conte	146.4159	128.0563	132.1426	115.2051	110.5421	95.3894	88.3923	101.4314	102.6429	119.6204	130.5750	141.7960	(45)
Energy content (annual)										Total = Sum(45)m =		1412.2092	(45)
Distribution loss (46)m = 0.15 x (45)m	21.9624	19.2084	19.8214	17.2808	16.5813	14.3084	13.2588	15.2147	15.3964	17.9431	19.5862	21.2694	(46)
Water storage loss:													
Store volume												2.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.2388	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.1290	(55)
Total storage loss													

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

	3.9977	3.6109	3.9977	3.8688	3.9977	3.8688	3.9977	3.9977	3.8688	3.9977	3.8688	3.9977	(56)
If cylinder contains dedicated solar storage													
	3.9977	3.6109	3.9977	3.8688	3.9977	3.8688	3.9977	3.9977	3.8688	3.9977	3.8688	3.9977	(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													
	173.6760	152.6783	159.4027	141.5859	137.8022	121.7702	115.6524	128.6916	129.0236	146.8805	156.9558	169.0561	(62)
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													
	173.6760	152.6783	159.4027	141.5859	137.8022	121.7702	115.6524	128.6916	129.0236	146.8805	156.9558	169.0561	(64)
								Total per year (kWh/year) = Sum(64)m =				1733.1754	(64)
Heat gains from water heating, kWh/month													
	70.4914	62.2764	65.7455	59.4103	58.5633	52.8216	51.1986	55.5341	55.2334	61.5819	64.5208	68.9553	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	18.4071	16.3490	13.2959	10.0659	7.5244	6.3524	6.8640	8.9221	11.9752	15.2052	17.7467	18.9187	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	206.4473	208.5895	203.1911	191.6984	177.1909	163.5559	154.4469	152.3047	157.7031	169.1958	183.7033	197.3383	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	(71)
Water heating gains (Table 5)													
	94.7465	92.6732	88.3676	82.5143	78.7142	73.3633	68.8153	74.6426	76.7130	82.7713	89.6122	92.6818	(72)
Total internal gains													
	380.6888	378.6997	365.9426	345.3665	324.5174	304.3596	291.2141	296.9572	307.4792	328.2603	352.1502	370.0267	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	2.9800	11.2829	0.6300	0.7000	0.7700	10.2757	(75)
East	13.4300	19.6403	0.6300	0.7000	0.7700	80.6112	(76)

Solar gains	90.8868	178.6090	297.3819	440.6420	547.3670	563.8571	535.3462	454.7292	347.9580	212.6770	113.4421	74.6823	(83)
Total gains	471.5756	557.3086	663.3245	786.0085	871.8843	868.2167	826.5602	751.6864	655.4372	540.9373	465.5923	444.7090	(84)

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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	62.5633	62.7446	62.9233	63.7765	63.9387	64.7048	64.7048	64.8487	64.4076	63.9387	63.6114	63.2728	
alpha	5.1709	5.1830	5.1949	5.2518	5.2626	5.3137	5.3137	5.3232	5.2938	5.2626	5.2408	5.2182	
util living area													
	0.9974	0.9933	0.9777	0.9155	0.7694	0.5708	0.4202	0.4796	0.7598	0.9618	0.9942	0.9981	(86)
MIT	19.8476	20.0214	20.3144	20.6722	20.9016	20.9837	20.9973	20.9948	20.9325	20.5947	20.1533	19.8203	(87)
Th 2	19.9927	19.9953	19.9979	20.0099	20.0122	20.0227	20.0227	20.0247	20.0187	20.0122	20.0076	20.0028	(88)
util rest of house													
	0.9965	0.9911	0.9703	0.8893	0.7119	0.4899	0.3283	0.3807	0.6798	0.9444	0.9919	0.9974	(89)
MIT 2	18.4590	18.7138	19.1378	19.6412	19.9230	20.0128	20.0218	20.0227	19.9685	19.5503	18.9161	18.4265	(90)
Living area fraction									fLA = Living area / (4) =			0.3405	(91)
MIT	18.9319	19.1591	19.5385	19.9923	20.2563	20.3434	20.3540	20.3537	20.2967	19.9060	19.3375	18.9012	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9319	19.1591	19.5385	19.9923	20.2563	20.3434	20.3540	20.3537	20.2967	19.9060	19.3375	18.9012	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9952	0.9886	0.9659	0.8888	0.7270	0.5171	0.3597	0.4145	0.7042	0.9421	0.9897	0.9964	(94)
Useful gains	469.2973	550.9451	640.7266	698.5949	633.8343	448.9376	297.2982	311.5720	461.5349	509.6110	460.7879	443.0931	(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													
	1201.8494	1167.8433	1064.8433	893.7774	687.6842	456.1431	298.1449	313.3112	494.4197	747.9389	988.6105	1193.9990	(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													
	545.0187	414.5556	315.5428	140.5314	40.0644	0.0000	0.0000	0.0000	0.0000	177.3160	380.0323	558.6740	(98)
Space heating												2571.7350	(98)
Space heating per m2											(98) / (4) =	34.7532	(99)

8c. Space cooling requirement

Not applicable

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												2750.5188	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	545.0187	414.5556	315.5428	140.5314	40.0644	0.0000	0.0000	0.0000	0.0000	177.3160	380.0323	558.6740	(98)
Space heating efficiency (main heating system 1)													
	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000		(210)
Space heating fuel (main heating system)													
	582.9077	443.3749	337.4789	150.3010	42.8496	0.0000	0.0000	0.0000	0.0000	189.6428	406.4516	597.5123	(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													
	173.6760	152.6783	159.4027	141.5859	137.8022	121.7702	115.6524	128.6916	129.0236	146.8805	156.9558	169.0561	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.6596	87.3476	86.6027	84.7939	81.9834	79.8000	79.8000	79.8000	79.8000	85.3171	87.0869	87.7662	(217)
Fuel for water heating, kWh/month													
	198.1255	174.7940	184.0621	166.9764	168.0856	152.5942	144.9279	161.2677	161.6838	172.1583	180.2289	192.6210	(219)
Water heating fuel used												2057.5253	(219)
Annual totals kWh/year													
Space heating fuel - main system												2750.5188	(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)												325.0756	(232)
Total delivered energy for all uses												5208.1196	(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	2750.5188	0.2160	594.1121	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2057.5253	0.2160	444.4255	(264)
Space and water heating			1038.5375	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	325.0756	0.5190	168.7142	(268)
Total CO2, kg/m2/year			1246.1767	(272)
Emissions per m2 for space and water heating			14.0343	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.2799	(272b)
Emissions per m2 for pumps and fans			0.5260	(272c)
Target Carbon Dioxide Emission Rate (TER) = (14.0343 * 1.00) + 2.2799 + 0.5260, rounded to 2 d.p.			16.8400	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	A-0-06	**Issued on Date**	05/02/2020
Assessment Reference	ASHP 46%	**Prop Type Ref**	2bed 3F
Property			

SAP Rating	87 B	**DER**	10.30	**TER**	15.30
Environmental	92 A	**% DER<TER**	32.70		
CO_2 Emissions (t/year)	0.80	**DFEE**	43.30	**TFEE**	47.30
General Requirements Compliance	Fail	**% DFEE<TFEE**	8.45		

Assessor Details	Miss Claudia Cioli, Claudia Cioli, Tel: 07481524839, clacioli@gmail.com	**Assessor ID**	R479-0001
Client			

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

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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England
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DWELLING AS DESIGNED

Ground-floor flat, total floor area 102 m²

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

1a TER and DER
Fuels for main heating:Mains gas (c), Electricity (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 15.30 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 10.30 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)47.3 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)43.3 kWh/m²/yrOK

---
2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.11 (max. 0.25)	0.11 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction

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

---
4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage Measured cylinder loss: 0.74 kWh/day
Permitted by DBSCG 0.32 Fail
Primary pipework insulated: No primary pipework

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

Hot water controls: No cylinderstat

---
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: 94%
Minimum: 70% OK

---
9 Summertime temperature
Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing East: 7.61 m², No overhang
Windows facing South West: 15.08 m², No overhang
Air change rate: 0.50 ach
Blinds/curtains: None

---
10 Key features
Party wall U-value 0.00 W/m²K
Floor U-value 0.11 W/m²K
Air permeability 3.0 m³/m²h
Photovoltaic array 0.49 kW

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	102.0000 (1b)	x	2.5400 (2b)	=	259.0800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	102.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	259.0800	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							0 * 10 =	0.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.0000	
Infiltration rate		0.1500	(18)
Number of sides sheltered		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

If mechanical ventilation:	0.5000	(23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	79.9000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2774	0.2739	0.2705	0.2531	0.2497	0.2323	0.2323	0.2288	0.2393	0.2497	0.2566	0.2635	(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	
W08 (Uw = 1.40)			11.2800	1.3258	14.9545			(27)
door			2.1000	1.4000	2.9400			(26a)
W11 (Uw = 1.40)			11.4100	1.3258	15.1269			(27)
Heat Loss Floor 1			102.0000	0.1100	11.2200	110.0000	11220.0000	(28a)
External Wall 1	71.1000	22.6900	48.4100	0.1500	7.2615	140.0000	6777.4000	(29a)
Corridor wall	3.8000	2.1000	1.7000	0.1409	0.2395	110.0000	187.0000	(29a)
Total net area of external elements Aum(A, m2)			176.9000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	51.7425			(33)
Party Wall 1			45.7000	0.0000	0.0000	140.0000	6398.0000	(32)
Party Ceilings			102.0000			80.0000	8160.0000	(32b)
Internal Wall			166.0000			9.0000	1494.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 34236.4000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	335.6510	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	11.3039	(36)
Total fabric heat loss	(33) + (36) = 63.0464	(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	23.7172	23.4207	23.1241	21.6413	21.3447	19.8619	19.8619	19.5653	20.4550	21.3447	21.9378	22.5310	(38)
Heat transfer coeff	86.7636	86.4671	86.1705	84.6877	84.3911	82.9083	82.9083	82.6117	83.5014	84.3911	84.9842	85.5774	(39)
Average = Sum(39)m / 12 =												84.6135	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8506	0.8477	0.8448	0.8303	0.8274	0.8128	0.8128	0.8099	0.8186	0.8274	0.8332	0.8390	(40)
HLP (average)												0.8295	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.7573 (42)
Average daily hot water use (litres/day)	104.9321 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	115.4253	111.2280	107.0308	102.8335	98.6362	94.4389	94.4389	98.6362	102.8335	107.0308	111.2280	115.4253	(44)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy conte	171.1724	149.7085	154.4858	134.6844	129.2329	111.5182	103.3380	118.5819	119.9981	139.8462	152.6531	165.7714	(45)
Energy content (annual)										Total = Sum(45)m =		1650.9909	(45)
Distribution loss (46)m = 0.15 x (45)m													
	25.6759	22.4563	23.1729	20.2027	19.3849	16.7277	15.5007	17.7873	17.9997	20.9769	22.8980	24.8657	(46)
Water storage loss:													
Store volume												2.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.7400	(48)
Temperature factor from Table 2b												1.0000	(49)
Enter (49) or (54) in (55)												0.7400	(55)
Total storage loss													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(56)
If cylinder contains dedicated solar storage													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(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													
	217.3748	191.4397	200.6882	179.3964	175.4353	156.2302	149.5404	164.7843	164.7101	186.0486	197.3651	211.9738	(62)
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													
	217.3748	191.4397	200.6882	179.3964	175.4353	156.2302	149.5404	164.7843	164.7101	186.0486	197.3651	211.9738	(64)
									Total per year (kWh/year) = Sum(64)m =			2194.9869	(64)
Heat gains from water heating, kWh/month													
	93.8768	83.1630	88.3284	80.5522	79.9319	72.8494	71.3218	76.3904	75.6690	83.4608	86.5267	92.0809	(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	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	23.1365	20.5496	16.7121	12.6521	9.4576	7.9845	8.6275	11.2144	15.0520	19.1119	22.3064	23.7795	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	259.5211	262.2141	255.4278	240.9805	222.7434	205.6032	194.1524	191.4594	198.2457	212.6930	230.9300	248.0703	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.7864	36.7864	36.7864	36.7864	36.7864	36.7864	36.7864	36.7864	36.7864	36.7864	36.7864	36.7864	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	(71)
Water heating gains (Table 5)													
	126.1784	123.7545	118.7210	111.8780	107.4353	101.1797	95.8626	102.6753	105.0958	112.1785	120.1760	123.7646	(72)
Total internal gains													
	473.1953	470.8775	455.2201	429.8699	403.9956	379.1267	363.0019	369.7083	382.7527	408.3426	437.7718	459.9738	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	11.2800	36.7938	0.3700	0.8900	0.7700	94.7129	(79)
East	7.6100	19.6403	0.3700	0.6800	0.7700	26.0601	(76)
Southwest	3.8000	36.7938	0.3700	0.6800	0.7700	24.3782	(79)

Solar gains	145.1512	253.8353	361.5120	466.3500	535.2631	536.0306	514.9372	463.5048	398.1787	284.6903	175.1376	123.3477	(83)
Total gains	618.3465	724.7128	816.7322	896.2200	939.2587	915.1573	877.9391	833.2131	780.9315	693.0330	612.9094	583.3215	(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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	109.6094	109.9854	110.3639	112.2963	112.6909	114.7064	114.7064	115.1182	113.8916	112.6909	111.9044	111.1288	
alpha	8.3073	8.3324	8.3576	8.4864	8.5127	8.6471	8.6471	8.6745	8.5928	8.5127	8.4603	8.4086	
util living area													
	0.9995	0.9979	0.9899	0.9441	0.7992	0.5776	0.4154	0.4558	0.7228	0.9685	0.9981	0.9997	(86)
MIT	20.3710	20.4934	20.6659	20.8644	20.9741	20.9985	20.9999	20.9998	20.9911	20.8432	20.5677	20.3520	(87)
Th 2	20.2097	20.2122	20.2147	20.2272	20.2297	20.2422	20.2422	20.2447	20.2372	20.2297	20.2247	20.2197	(88)
util rest of house													
	0.9993	0.9970	0.9855	0.9223	0.7462	0.5104	0.3439	0.3811	0.6501	0.9514	0.9971	0.9996	(89)
MIT 2	19.3643	19.5450	19.7964	20.0797	20.2086	20.2415	20.2422	20.2447	20.2319	20.0591	19.6642	19.3446	(90)
Living area fraction										fLA = Living area / (4) =		0.3696	(91)
MIT	19.7364	19.8956	20.1177	20.3697	20.4915	20.5213	20.5223	20.5238	20.5125	20.3489	19.9981	19.7169	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7364	19.8956	20.1177	20.3697	20.4915	20.5213	20.5223	20.5238	20.5125	20.3489	19.9981	19.7169	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9991	0.9965	0.9848	0.9269	0.7650	0.5353	0.3704	0.4088	0.6770	0.9545	0.9968	0.9994	(94)
Useful gains	617.8042	722.1926	804.3025	830.6661	718.5060	489.8757	325.1500	340.5879	528.6959	661.5021	610.9256	582.9973	(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													
	1339.3169	1296.6215	1173.4481	971.3416	741.9246	490.9211	325.1882	340.6739	535.4507	822.7185	1096.1374	1327.8995	(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													
	536.8054	386.0162	274.6443	101.2863	17.4234	0.0000	0.0000	0.0000	0.0000	119.9450	349.3525	554.2073	(98)
Space heating												2339.6805	(98)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Space heating per m2		(98) / (4) =	22.9380 (99)

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)			0.0000 (301)
Fraction of space heat from community system			1.0000 (302)
Fraction of heat from community Heat pump			0.4600 (303a)
Fraction of heat from community Boilers			0.5400 (303b)
Fraction of total space heat from community Heat pump			0.4600 (304a)
Fraction of total space heat from community Boilers			0.5400 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating			1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating			1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system			1.0500 (306)
Space heating:			
Annual space heating requirement			2339.6805 (98)
Space heat from Heat pump = (98) x 0.46 x 1.00 x 1.05			1130.0657 (307a)
Space heat from Boilers = (98) x 0.54 x 1.00 x 1.05			1326.5988 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)			0.0000 (308)
Space heating fuel for secondary/supplementary system			0.0000 (309)
Water heating			
Annual water heating requirement			2194.9869 (64)
Water heat from Heat pump = (64) x 0.46 x 1.00 x 1.05			1060.1786 (310a)
Water heat from Boilers = (64) x 0.54 x 1.00 x 1.05			1244.5575 (310b)
Electricity used for heat distribution			47.6140 (313)
Annual totals kWh/year			
Electricity for pumps and fans:			
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.2500, SFP = 0.6625)			
mechanical ventilation fans (SFP = 0.6625)			209.4014 (330a)
Total electricity for the above, kWh/year			209.4014 (331)
Electricity for lighting (calculated in Appendix L)			408.5977 (332)
Energy saving/generation technologies (Appendices M ,N and Q)			
PV Unit 0 (0.80 * 0.49 * 951 * 1.00) =		-372.6415	-372.6415 (333)
Total delivered energy for all uses			5006.7583 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			370.0000	(367a)
Space heating from Heat pump	591.9579	0.5190	307.2262	(367)
Efficiency of heat source Boilers			93.9000	(367b)
Space heating from Boilers	2738.1857	0.2160	591.4481	(368)
Electrical energy for heat distribution	47.6140	0.5190	24.7117	(372)
Total CO2 associated with community systems			923.3859	(373)
(negative value allowed since DFEE <= TFEE)				
Space and water heating			923.3859	(376)
Pumps and fans	209.4014	0.5190	108.6793	(378)
Energy for lighting	408.5977	0.5190	212.0622	(379)
Energy saving/generation technologies				
PV Unit	-372.6415	0.5190	-193.4009	(380)
Total CO2, kg/year			1050.7266	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			10.3000	(384)

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

DER		10.3000	ZC1
Total Floor Area	TFA	102.0000	
Assumed number of occupants	N	2.7573	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		15.0771	ZC2
CO2 emissions from cooking, equation (L16)		1.8154	ZC3
Total CO2 emissions		27.1926	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		27.1926	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	102.0000 (1b)	x	2.5400 (2b)	=	259.0800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	102.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	259.0800	(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							4 * 10 =	40.0000	(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) =	40.0000 / (5) =	0.1544	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.4044	(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) =	0.3741	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4769	0.4676	0.4582	0.4115	0.4021	0.3554	0.3554	0.3460	0.3741	0.4021	0.4208	0.4395	(22b)
Effective ac	0.6137	0.6093	0.6050	0.5847	0.5808	0.5631	0.5631	0.5599	0.5700	0.5808	0.5885	0.5966	(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 Semi-glazed door			2.1000	1.2000	2.5200			(26a)
TER Opening Type (Uw = 1.40)			22.6900	1.3258	30.0814			(27)
Heat Loss Floor 1			102.0000	0.1300	13.2600			(28a)
External Wall 1	71.1000	22.6900	48.4100	0.1800	8.7138			(29a)
Corridor wall	3.8000	2.1000	1.7000	0.1800	0.3060			(29a)
Total net area of external elements Aum(A, m2)			176.9000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	54.8812			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	8.9914	(36)
Total fabric heat loss (33) + (36) =	63.8726	(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	52.4718	52.0942	51.7241	49.9858	49.6605	48.1465	48.1465	47.8661	48.7297	49.6605	50.3185	51.0064	(38)
Heat transfer coeff	116.3445	115.9669	115.5968	113.8584	113.5332	112.0191	112.0191	111.7387	112.6023	113.5332	114.1911	114.8790	(39)
Average = Sum(39)m / 12 =												113.8569	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1406	1.1369	1.1333	1.1163	1.1131	1.0982	1.0982	1.0955	1.1039	1.1131	1.1195	1.1263	(40)
HLP (average)												1.1162	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.7573 (42)
Average daily hot water use (litres/day)	99.6855 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.6541	105.6666	101.6792	97.6918	93.7044	89.7170	89.7170	93.7044	97.6918	101.6792	105.6666	109.6541	(44)
Energy conte	162.6138	142.2231	146.7615	127.9502	122.7713	105.9423	98.1711	112.6528	113.9982	132.8539	145.0204	157.4828	(45)
Energy content (annual)										Total = Sum(45)m =		1568.4413	(45)
Distribution loss (46)m = 0.15 x (45)m	24.3921	21.3335	22.0142	19.1925	18.4157	15.8913	14.7257	16.8979	17.0997	19.9281	21.7531	23.6224	(46)

Water storage loss:	
Store volume	2.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	0.2388 (48)
Temperature factor from Table 2b	0.5400 (49)
Enter (49) or (54) in (55)	0.1290 (55)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss
3.9977 3.6109 3.9977 3.8688 3.9977 3.8688 3.9977 3.9977 3.8688 3.9977 3.8688 3.9977 (56)
If cylinder contains dedicated solar storage
3.9977 3.6109 3.9977 3.8688 3.9977 3.8688 3.9977 3.9977 3.8688 3.9977 3.8688 3.9977 (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
189.8740 166.8451 174.0216 154.3310 150.0314 132.3231 125.4312 139.9129 140.3790 160.1140 171.4012 184.7429 (62)
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
189.8740 166.8451 174.0216 154.3310 150.0314 132.3231 125.4312 139.9129 140.3790 160.1140 171.4012 184.7429 (64)
Total per year (kWh/year) = Sum(64)m = 1889.4075 (64)
Heat gains from water heating, kWh/month
75.8772 66.9868 70.6063 63.6481 62.6296 56.3304 54.4500 59.2652 59.0090 65.9820 69.3239 74.1711 (65)

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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	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
23.1376 20.5506 16.7129 12.6527 9.4581 7.9849 8.6280 11.2149 15.0527 19.1128 22.3075 23.7806 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
259.5211 262.2141 255.4278 240.9805 222.7434 205.6032 194.1524 191.4594 198.2457 212.6930 230.9300 248.0703 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
36.7864 36.7864 36.7864 36.7864 36.7864 36.7864 36.7864 36.7864 36.7864 36.7864 36.7864 36.7864 (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)
-110.2914 -110.2914 -110.2914 -110.2914 -110.2914 -110.2914 -110.2914 -110.2914 -110.2914 -110.2914 -110.2914 -110.2914 (71)
Water heating gains (Table 5)
101.9855 99.6828 94.9009 88.4001 84.1795 78.2367 73.1855 79.6575 81.9570 88.6855 96.2832 99.6924 (72)
Total internal gains
452.0034 449.8067 434.4009 409.3926 383.7403 359.1840 343.3251 349.6911 362.6146 387.8506 416.8800 438.9026 (73)

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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	7.6100	19.6403	0.6300	0.7000	0.7700	45.6777	(76)
Southwest	15.0800	36.7938	0.6300	0.7000	0.7700	169.5697	(79)

Solar gains	215.2473	378.1951	542.3586	704.2933	811.4994	813.7609	781.3036	701.2876	599.0693	425.2571	260.0601	182.6794	(83)
Total gains	667.2508	828.0018	976.7595	1113.6859	1195.2397	1172.9450	1124.6288	1050.9786	961.6839	813.1077	676.9401	621.5820	(84)

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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	60.8824	61.0807	61.2762	62.2118	62.3900	63.2333	63.2333	63.3919	62.9058	62.3900	62.0305	61.6591	
alpha	5.0588	5.0720	5.0851	5.1475	5.1593	5.2156	5.2156	5.2261	5.1937	5.1593	5.1354	5.1106	

util living area
0.9971 0.9909 0.9722 0.9121 0.7816 0.5921 0.4349 0.4830 0.7380 0.9495 0.9928 0.9979 (86)

MIT	19.8216	20.0341	20.3290	20.6648	20.8873	20.9791	20.9965	20.9941	20.9376	20.6211	20.1526	19.7889	(87)
Th 2	19.9678	19.9708	19.9737	19.9876	19.9902	20.0023	20.0023	20.0045	19.9976	19.9902	19.9849	19.9794	(88)

util rest of house
0.9961 0.9880 0.9631 0.8850 0.7241 0.5079 0.3381 0.3817 0.6558 0.9277 0.9899 0.9972 (89)

MIT 2	18.4032	18.7141	19.1394	19.6119	19.8874	19.9894	20.0011	20.0023	19.9522	19.5669	18.8984	18.3638	(90)

Living area fraction fLA = Living area / (4) = 0.3696 (91)

MIT	18.9274	19.2020	19.5791	20.0011	20.2570	20.3552	20.3690	20.3689	20.3164	19.9565	19.3619	18.8905	(92)

Temperature adjustment 0.0000
adjusted MIT 18.9274 19.2020 19.5791 20.0011 20.2570 20.3552 20.3690 20.3689 20.3164 19.9565 19.3619 18.8905 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9947	0.9850	0.9587	0.8854	0.7404	0.5385	0.3740	0.4193	0.6836	0.9268	0.9875	0.9962	(94)
Useful gains	663.6814	815.5886	936.4452	986.0461	884.9269	631.5766	420.6028	440.6414	657.4375	753.6179	668.4721	619.1937	(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
1701.8192 1658.5530 1511.8966 1263.9509 971.5007 644.6966 422.1983 443.4760 699.9799 1062.2786 1400.2047 1687.6324 (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
772.3745 566.4721 428.1358 200.0915 64.4109 0.0000 0.0000 0.0000 0.0000 229.6436 526.8474 794.9184 (98)
Space heating 3582.8941 (98)
Space heating per m2 (98) / (4) = 35.1264 (99)

8c. Space cooling requirement

Not applicable

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												3831.9723	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	772.3745	566.4721	428.1358	200.0915	64.4109	0.0000	0.0000	0.0000	0.0000	229.6436	526.8474	794.9184	(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)	826.0690	605.8525	457.8993	214.0016	68.8887	0.0000	0.0000	0.0000	0.0000	245.6081	563.4732	850.1801	(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	189.8740	166.8451	174.0216	154.3310	150.0314	132.3231	125.4312	139.9129	140.3790	160.1140	171.4012	184.7429	(64)
Efficiency of water heater												79.8000	(216)
(217)m	88.1673	87.8208	87.1239	85.5075	82.7383	79.8000	79.8000	79.8000	79.8000	85.7753	87.6162	88.2681	(217)
Fuel for water heating, kWh/month	215.3565	189.9836	199.7403	180.4882	181.3326	165.8184	157.1820	175.3295	175.9135	186.6669	195.6274	209.2975	(219)
Water heating fuel used												2232.7364	(219)
Annual totals kWh/year													
Space heating fuel - main system												3831.9723	(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)												408.6169	(232)
Total delivered energy for all uses												6548.3256	(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	3831.9723	0.2160	827.7060	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2232.7364	0.2160	482.2711	(264)
Space and water heating			1309.9771	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	408.6169	0.5190	212.0722	(268)
Total CO2, kg/m2/year			1560.9743	(272)
Emissions per m2 for space and water heating			12.8429	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.0791	(272b)
Emissions per m2 for pumps and fans			0.3816	(272c)
Target Carbon Dioxide Emission Rate (TER) = (12.8429 * 1.00) + 2.0791 + 0.3816, rounded to 2 d.p.			15.3000	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	A-1-01	**Issued on Date**	05/02/2020
Assessment Reference	ASHP 46%	**Prop Type Ref**	2bed 3F
Property			

SAP Rating	86 B	**DER**	10.77	**TER**	17.69
Environmental	93 A	**% DER<TER**	39.13		
CO_2 Emissions (t/year)	0.46	**DFEE**	42.59	**TFEE**	44.47
General Requirements Compliance	Fail	**% DFEE<TFEE**	4.23		

Assessor Details	Miss Claudia Cioli, Claudia Cioli, Tel: 07481524839, clacioli@gmail.com	**Assessor ID**	R479-0001
Client			

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DWELLING AS DESIGNED

Mid-floor flat, total floor area 55 m²

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

1a TER and DER
Fuels for main heating:Mains gas (c), Electricity (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 17.69 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 10.77 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)44.5 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)42.6 kWh/m²/yrOK

---
2 Fabric U-values

Element	Average	Highest	
External wall	0.14 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.38 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction

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

---
4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage Measured cylinder loss: 0.74 kWh/day
Permitted by DBSCG 0.32 Fail
Primary pipework insulated: No primary pipework

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

Hot water controls: No cylinderstat

---
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: 94%
Minimum: 70% OK

---
9 Summertime temperature
Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing North: 8.40 m², No overhang
Windows facing North East: 1.64 m², No overhang
Windows facing South East: 7.61 m², No overhang
Air change rate: 0.50 ach
Blinds/curtains: None

---
10 Key features
Party wall U-value 0.00 W/m²K
Air permeability 3.0 m³/m²h
Photovoltaic array 0.49 kW

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	54.5000 (1b)	x	2.5400 (2b)	=	138.4300	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	54.5000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	138.4300	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							0 * 10 =	0.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.0000	
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1163	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation:	0.5000	(23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	79.9000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2487	0.2458	0.2429	0.2284	0.2255	0.2109	0.2109	0.2080	0.2168	0.2255	0.2313	0.2371	(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	
W05 (Uw = 1.40)			1.6400	1.3258	2.1742			(27)
W03 (Uw = 1.40)			8.4000	1.3258	11.1364			(27)
W02 (Uw = 1.40)			7.6100	1.3258	10.0890			(27)
door			2.1000	1.2500	2.6250			(26a)
External Wall 1	32.4000	17.6500	14.7500	0.1500	2.2125	140.0000	2065.0000	(29a)
Corridor wall	43.3000	2.1000	41.2000	0.1409	5.8055	110.0000	4532.0000	(29a)
Total net area of external elements Aum(A, m2)			75.7000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		34.0427			(33)
Party Wall 1			19.4000	0.0000	0.0000	140.0000	2716.0000	(32)
Party Floor 1			54.5000			40.0000	2180.0000	(32d)
Party Ceilings			54.5000			80.0000	4360.0000	(32b)
Internal Wall			73.4000			9.0000	660.6000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 16513.6000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	303.0018	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	5.2116	(36)
Total fabric heat loss	(33) + (36) = 39.2543	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	11.3619	11.2292	11.0964	10.4326	10.2998	9.6360	9.6360	9.5033	9.9016	10.2998	10.5654	10.8309	(38)
Heat transfer coeff	50.6162	50.4834	50.3507	49.6869	49.5541	48.8903	48.8903	48.7575	49.1558	49.5541	49.8196	50.0852	(39)
Average = Sum(39)m / 12 =												49.6537	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9287	0.9263	0.9239	0.9117	0.9092	0.8971	0.8971	0.8946	0.9019	0.9092	0.9141	0.9190	(40)
HLP (average)												0.9111	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.8227 (42)
Average daily hot water use (litres/day)	81.5674 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	89.7241	86.4614	83.1987	79.9360	76.6733	73.4106	73.4106	76.6733	79.9360	83.1987	86.4614	89.7241	(44)
Energy conte	133.0582	116.3736	120.0871	104.6949	100.4572	86.6869	80.3282	92.1778	93.2787	108.7073	118.6625	128.8598	(45)
Energy content (annual)										Total = Sum(45)m =		1283.3722	(45)
Distribution loss (46)m = 0.15 x (45)m													
	19.9587	17.4560	18.0131	15.7042	15.0686	13.0030	12.0492	13.8267	13.9918	16.3061	17.7994	19.3290	(46)
Water storage loss:													
Store volume												2.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.7400	(48)
Temperature factor from Table 2b												1.0000	(49)
Enter (49) or (54) in (55)												0.7400	(55)
Total storage loss													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(56)
If cylinder contains dedicated solar storage													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(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													
	179.2606	158.1048	166.2895	149.4069	146.6596	131.3989	126.5306	138.3802	137.9907	154.9097	163.3745	175.0622	(62)
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													
	179.2606	158.1048	166.2895	149.4069	146.6596	131.3989	126.5306	138.3802	137.9907	154.9097	163.3745	175.0622	(64)
									Total per year (kWh/year) = Sum(64)m =			1827.3682	(64)
Heat gains from water heating, kWh/month													
	81.2038	72.0792	76.8909	70.5806	70.3639	64.5930	63.6710	67.6110	66.7848	73.1071	75.2249	79.8078	(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	91.1347	91.1347	91.1347	91.1347	91.1347	91.1347	91.1347	91.1347	91.1347	91.1347	91.1347	91.1347	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	14.1657	12.5819	10.2323	7.7465	5.7906	4.8887	5.2824	6.8662	9.2158	11.7016	13.6575	14.5594	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	158.8961	160.5450	156.3899	147.5444	136.3784	125.8840	118.8731	117.2242	121.3793	130.2248	141.3908	151.8852	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	32.1135	32.1135	32.1135	32.1135	32.1135	32.1135	32.1135	32.1135	32.1135	32.1135	32.1135	32.1135	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-72.9078	-72.9078	-72.9078	-72.9078	-72.9078	-72.9078	-72.9078	-72.9078	-72.9078	-72.9078	-72.9078	-72.9078	(71)
Water heating gains (Table 5)													
	109.1449	107.2607	103.3480	98.0287	94.5752	89.7125	85.5794	90.8750	92.7566	98.2622	104.4790	107.2686	(72)
Total internal gains													
	332.5471	330.7279	320.3106	303.6599	287.0846	270.8256	260.0752	265.3059	273.6921	290.5291	309.8677	324.0536	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	1.6400	11.2829	0.3700	0.7900	0.7700	3.7482	(75)
North	8.4000	10.6334	0.3700	0.8900	0.7700	20.3834	(74)
Southeast	7.6100	36.7938	0.5600	0.6800	0.7700	73.8907	(77)

Solar gains	98.0223	172.4466	252.1496	342.2747	412.5714	422.9506	402.1702	347.3383	282.8027	194.7990	118.3658	83.2886	(83)
Total gains	430.5694	503.1745	572.4601	645.9346	699.6560	693.7762	662.2454	612.6442	556.4948	485.3280	428.2335	407.3422	(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	90.6253	90.8637	91.1033	92.3204	92.5677	93.8246	93.8246	94.0801	93.3178	92.5677	92.0744	91.5862	
alpha	7.0417	7.0576	7.0736	7.1547	7.1712	7.2550	7.2550	7.2720	7.2212	7.1712	7.1383	7.1057	
util living area													
	0.9957	0.9868	0.9550	0.8437	0.6470	0.4502	0.3248	0.3659	0.6027	0.9023	0.9874	0.9970	(86)
MIT	20.3632	20.5164	20.7195	20.9138	20.9875	20.9992	20.9999	20.9999	20.9942	20.8812	20.5868	20.3335	(87)
Th 2	20.1431	20.1452	20.1473	20.1576	20.1596	20.1700	20.1700	20.1721	20.1658	20.1596	20.1555	20.1514	(88)
util rest of house													
	0.9942	0.9822	0.9405	0.8059	0.5930	0.3922	0.2635	0.3002	0.5330	0.8667	0.9821	0.9959	(89)
MIT 2	19.3061	19.5283	19.8140	20.0706	20.1499	20.1696	20.1700	20.1720	20.1624	20.0405	19.6397	19.2695	(90)
Living area fraction									fLA = Living area / (4) =			0.4624	(91)
MIT	19.7949	19.9852	20.2327	20.4605	20.5372	20.5532	20.5537	20.5548	20.5470	20.4292	20.0776	19.7615	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7949	19.9852	20.2327	20.4605	20.5372	20.5532	20.5537	20.5548	20.5470	20.4292	20.0776	19.7615	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9933	0.9811	0.9422	0.8202	0.6176	0.4191	0.2919	0.3306	0.5652	0.8792	0.9815	0.9952	(94)
Useful gains	427.6998	493.6744	539.3488	529.8102	432.1033	290.7424	193.2812	202.5342	314.5454	426.6966	420.3181	405.3984	(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													
	784.2930	761.5517	691.4495	574.4027	437.9197	291.0522	193.2993	202.5776	316.9081	487.0779	646.5406	779.4005	(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													
	265.3054	180.0135	113.1630	32.1066	4.3274	0.0000	0.0000	0.0000	0.0000	44.9237	162.8802	278.2576	(98)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Space heating			1080.9773 (98)
Space heating per m2	(98) / (4) =		19.8344 (99)

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)			0.0000 (301)
Fraction of space heat from community system			1.0000 (302)
Fraction of heat from community Heat pump			0.4600 (303a)
Fraction of heat from community Boilers			0.5400 (303b)
Fraction of total space heat from community Heat pump			0.4600 (304a)
Fraction of total space heat from community Boilers			0.5400 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating			1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating			1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system			1.0500 (306)
Space heating:			
Annual space heating requirement			1080.9773 (98)
Space heat from Heat pump = (98) x 0.46 x 1.00 x 1.05			522.1120 (307a)
Space heat from Boilers = (98) x 0.54 x 1.00 x 1.05			612.9141 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)			0.0000 (308)
Space heating fuel for secondary/supplementary system			0.0000 (309)
Water heating			
Annual water heating requirement			1827.3682 (64)
Water heat from Heat pump = (64) x 0.46 x 1.00 x 1.05			882.6188 (310a)
Water heat from Boilers = (64) x 0.54 x 1.00 x 1.05			1036.1178 (310b)
Electricity used for heat distribution			30.5376 (313)
Annual totals kWh/year			
Electricity for pumps and fans:			
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.2500, SFP = 0.6625)			
mechanical ventilation fans (SFP = 0.6625)			111.8860 (330a)
Total electricity for the above, kWh/year			111.8860 (331)
Electricity for lighting (calculated in Appendix L)			250.1708 (332)
Energy saving/generation technologies (Appendices M ,N and Q)			
PV Unit 0 (0.80 * 0.49 * 951 * 1.00) =	-372.6415		-372.6415 (333)
Total delivered energy for all uses			3043.1781 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			370.0000	(367a)
Space heating from Heat pump	379.6570	0.5190	197.0420	(367)
Efficiency of heat source Boilers			93.9000	(367b)
Space heating from Boilers	1756.1575	0.2160	379.3300	(368)
Electrical energy for heat distribution	30.5376	0.5190	15.8490	(372)
Total CO2 associated with community systems			592.2210	(373)
(negative value allowed since DFEE <= TFEE)				
Space and water heating			592.2210	(376)
Pumps and fans	111.8860	0.5190	58.0689	(378)
Energy for lighting	250.1708	0.5190	129.8386	(379)
Energy saving/generation technologies				
PV Unit	-372.6415	0.5190	-193.4009	(380)
Total CO2, kg/year			586.7276	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			10.7700	(384)

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

DER		10.7700	ZC1
Total Floor Area	TFA	54.5000	
Assumed number of occupants	N	1.8227	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.2768	ZC2
CO2 emissions from cooking, equation (L16)		2.9861	ZC3
Total CO2 emissions		31.0329	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		31.0329	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	54.5000 (1b)	x	2.5400 (2b)	=	138.4300	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	54.5000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	138.4300	(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)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1445	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3945	(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) =	0.3057	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3898	0.3821	0.3745	0.3363	0.3286	0.2904	0.2904	0.2828	0.3057	0.3286	0.3439	0.3592	(22b)
Effective ac	0.5760	0.5730	0.5701	0.5565	0.5540	0.5422	0.5422	0.5400	0.5467	0.5540	0.5591	0.5645	(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 Semi-glazed door			2.1000	1.2000	2.5200			(26a)
TER Opening Type (Uw = 1.40)			11.5200	1.3258	15.2727			(27)
External Wall 1	32.4000	11.5200	20.8800	0.1800	3.7584			(29a)
Corridor wall	43.3000	2.1000	41.2000	0.1800	7.4160			(29a)
Total net area of external elements Aum(A, m2)			75.7000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.9671			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							3.1241	(36)
Total fabric heat loss					(33) + (36) =		32.0912	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.3114	26.1766	26.0445	25.4241	25.3080	24.7676	24.7676	24.6676	24.9758	25.3080	25.5428	25.7883	(38)
Heat transfer coeff	58.4026	58.2678	58.1357	57.5153	57.3992	56.8589	56.8589	56.7588	57.0670	57.3992	57.6341	57.8796	(39)
Average = Sum(39)m / 12 =												57.5148	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0716	1.0691	1.0667	1.0553	1.0532	1.0433	1.0433	1.0414	1.0471	1.0532	1.0575	1.0620	(40)
HLP (average)												1.0553	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.8227 (42)
Average daily hot water use (litres/day)		77.4890 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	85.2379	82.1383	79.0388	75.9392	72.8397	69.7401	69.7401	72.8397	75.9392	79.0388	82.1383	85.2379	(44)
Energy conte	126.4053	110.5549	114.0828	99.4601	95.4343	82.3526	76.3118	87.5689	88.6147	103.2719	112.7294	122.4168	(45)
Energy content (annual)										Total = Sum(45)m =		1219.2036	(45)
Distribution loss (46)m = 0.15 x (45)m	18.9608	16.5832	17.1124	14.9190	14.3152	12.3529	11.4468	13.1353	13.2922	15.4908	16.9094	18.3625	(46)
Water storage loss:													
Store volume												2.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.2388	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.1290	(55)
Total storage loss													

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

	3.9977	3.6109	3.9977	3.8688	3.9977	3.8688	3.9977	3.9977	3.8688	3.9977	3.8688	3.9977 (56)
If cylinder contains dedicated solar storage												
	3.9977	3.6109	3.9977	3.8688	3.9977	3.8688	3.9977	3.9977	3.8688	3.9977	3.8688	3.9977 (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												
	153.6655	135.1770	141.3429	125.8409	122.6945	108.7334	103.5719	114.8290	114.9955	130.5321	139.1102	149.6770 (62)
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												
	153.6655	135.1770	141.3429	125.8409	122.6945	108.7334	103.5719	114.8290	114.9955	130.5321	139.1102	149.6770 (64)
								Total per year (kWh/year) = Sum(64)m =				1540.1698 (64)
Heat gains from water heating, kWh/month												
	63.8379	56.4572	59.7406	54.1751	53.5400	48.4869	47.1818	50.9248	50.5690	56.1460	58.5871	62.5117 (65)

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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	91.1347	91.1347	91.1347	91.1347	91.1347	91.1347	91.1347	91.1347	91.1347	91.1347	91.1347	91.1347	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	14.1983	12.6108	10.2558	7.7643	5.8039	4.8999	5.2945	6.8820	9.2370	11.7285	13.6889	14.5929	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	158.8961	160.5450	156.3899	147.5444	136.3784	125.8840	118.8731	117.2242	121.3793	130.2248	141.3908	151.8852	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	32.1135	32.1135	32.1135	32.1135	32.1135	32.1135	32.1135	32.1135	32.1135	32.1135	32.1135	32.1135	(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)													
	-72.9078	-72.9078	-72.9078	-72.9078	-72.9078	-72.9078	-72.9078	-72.9078	-72.9078	-72.9078	-72.9078	-72.9078	(71)
Water heating gains (Table 5)													
	85.8036	84.0136	80.2965	75.2432	71.9624	67.3429	63.4164	68.4473	70.2348	75.4651	81.3710	84.0211	(72)
Total internal gains													
	312.2384	310.5098	300.2827	283.8923	267.4851	251.4672	240.9244	245.8939	254.1914	270.7588	289.7911	303.8396	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	5.4800	10.6334	0.6300	0.7000	0.7700	17.8084	(74)
Northeast	1.0700	11.2829	0.6300	0.7000	0.7700	3.6896	(75)
Southeast	4.9700	36.7938	0.6300	0.7000	0.7700	55.8860	(77)

Solar gains	77.3840	136.7376	201.6104	276.4969	335.7665	345.2594	327.8724	281.5311	227.0507	154.8999	93.5500	65.6858	(83)
Total gains	389.6224	447.2474	501.8931	560.3892	603.2516	596.7265	568.7967	527.4250	481.2421	425.6588	383.3411	369.5255	(84)

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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	64.8040	64.9539	65.1015	65.8037	65.9368	66.5635	66.5635	66.6808	66.3207	65.9368	65.6682	65.3896	
alpha	5.3203	5.3303	5.3401	5.3869	5.3958	5.4376	5.4376	5.4454	5.4214	5.3958	5.3779	5.3593	
util living area													
	0.9954	0.9898	0.9736	0.9191	0.7878	0.5930	0.4370	0.4895	0.7490	0.9477	0.9900	0.9965	(86)
MIT	19.9730	20.1335	20.3800	20.6828	20.8973	20.9823	20.9972	20.9949	20.9415	20.6605	20.2610	19.9420	(87)
Th 2	20.0241	20.0261	20.0281	20.0375	20.0392	20.0474	20.0474	20.0489	20.0443	20.0392	20.0357	20.0320	(88)
util rest of house													
	0.9940	0.9866	0.9651	0.8940	0.7326	0.5119	0.3439	0.3912	0.6699	0.9258	0.9862	0.9954	(89)
MIT 2	18.6643	18.8987	19.2539	19.6789	19.9448	20.0364	20.0464	20.0469	20.0010	19.6597	19.0923	18.6250	(90)
Living area fraction										fLA = Living area / (4) =		0.4624	(91)
MIT	19.2694	19.4696	19.7746	20.1431	20.3852	20.4738	20.4860	20.4853	20.4359	20.1225	19.6327	19.2339	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2694	19.4696	19.7746	20.1431	20.3852	20.4738	20.4860	20.4853	20.4359	20.1225	19.6327	19.2339	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9924	0.9842	0.9624	0.8971	0.7536	0.5489	0.3871	0.4368	0.7042	0.9281	0.9842	0.9941	(94)
Useful gains	386.6734	440.1748	483.0225	502.7043	454.6279	327.5592	220.1627	230.3874	338.8671	395.0398	377.2728	367.3576	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	874.2531	848.9417	771.7302	646.6511	498.5266	333.9769	220.9547	231.8747	361.5702	546.5821	722.3110	870.1584	(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													
	362.7593	274.6913	214.7985	103.6417	32.6607	0.0000	0.0000	0.0000	0.0000	112.7475	248.4275	374.0838	(98)
Space heating												1723.8103	(98)
Space heating per m2											(98) / (4) =	31.6295	(99)

8c. Space cooling requirement

Not applicable

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												1843.6473	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	362.7593	274.6913	214.7985	103.6417	32.6607	0.0000	0.0000	0.0000	0.0000	112.7475	248.4275	374.0838	(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)													
	387.9779	293.7875	229.7310	110.8467	34.9312	0.0000	0.0000	0.0000	0.0000	120.5855	265.6979	400.0896	(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													
Water heating requirement													
	153.6655	135.1770	141.3429	125.8409	122.6945	108.7334	103.5719	114.8290	114.9955	130.5321	139.1102	149.6770	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.0278	86.6674	85.9274	84.3015	81.8341	79.8000	79.8000	79.8000	79.8000	84.4261	86.3442	87.1602	(217)
Fuel for water heating, kWh/month													
	176.5706	155.9721	164.4911	149.2748	149.9308	136.2574	129.7894	143.8960	144.1047	154.6111	161.1113	171.7263	(219)
Water heating fuel used												1837.7355	(219)
Annual totals kWh/year													
Space heating fuel - main system												1843.6473	(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)												250.7461	(232)
Total delivered energy for all uses												4007.1290	(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	1843.6473	0.2160	398.2278	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1837.7355	0.2160	396.9509	(264)
Space and water heating			795.1787	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	250.7461	0.5190	130.1372	(268)
Total CO2, kg/m2/year			964.2409	(272)
Emissions per m2 for space and water heating			14.5904	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.3878	(272b)
Emissions per m2 for pumps and fans			0.7142	(272c)
Target Carbon Dioxide Emission Rate (TER) = (14.5904 * 1.00) + 2.3878 + 0.7142, rounded to 2 d.p.			17.6900	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	A-1-03	**Issued on Date**	05/02/2020
Assessment Reference	ASHP 46%	**Prop Type Ref**	2bed 3F
Property			

SAP Rating	87 B	**DER**	9.25	**TER**	16.42
Environmental	94 A	**% DER<TER**	43.66		
CO_2 Emissions (t/year)	0.42	**DFEE**	34.79	**TFEE**	40.16
General Requirements Compliance	Fail	**% DFEE<TFEE**	13.37		

Assessor Details	Miss Claudia Cioli, Claudia Cioli, Tel: 07481524839, clacioli@gmail.com	**Assessor ID**	R479-0001
Client			

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

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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England
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DWELLING AS DESIGNED

Mid-floor flat, total floor area 59 m²

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

1a TER and DER
Fuels for main heating:Mains gas (c), Electricity (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 16.42 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 9.25 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)40.2 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)34.8 kWh/m²/yrOK

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2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.38 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction

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

---
4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage Measured cylinder loss: 0.74 kWh/day
Permitted by DBSCG 0.32 Fail
Primary pipework insulated: No primary pipework

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

Hot water controls: No cylinderstat

---
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: 94%
Minimum: 70% OK

---
9 Summertime temperature
Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing West: 12.20 m², No overhang
Air change rate: 0.50 ach
Blinds/curtains: None

---
10 Key features
Party wall U-value 0.00 W/m²K
Air permeability 3.0 m³/m²h
Photovoltaic array 0.49 kW

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	58.5000 (1b)	x	2.5400 (2b)	=	148.5900	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	58.5000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	148.5900	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							0 * 10 =	0.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.0000	
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1163	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation:	0.5000	(23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	79.9000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2487	0.2458	0.2429	0.2284	0.2255	0.2109	0.2109	0.2080	0.2168	0.2255	0.2313	0.2371	(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	
W03 (Uw = 1.40)			8.4000	1.3258	11.1364			(27)
W02 (Uw = 1.40)			3.8000	1.3258	5.0379			(27)
door			2.1000	1.2500	2.6250			(26a)
External Wall 1	37.1000	12.2000	24.9000	0.1500	3.7350	140.0000	3486.0000	(29a)
Corridor wall	25.4000	2.1000	23.3000	0.1409	3.2832	110.0000	2563.0000	(29a)
Total net area of external elements Aum(A, m2)			62.5000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.8175			(33)
Party Wall 1			22.6000	0.0000	0.0000	140.0000	3164.0000	(32)
Party Floor 1			58.5000			40.0000	2340.0000	(32d)
Party Ceilings			58.5000			80.0000	4680.0000	(32b)
Internal Wall			77.4000			9.0000	696.6000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 16929.6000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	289.3949	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	4.0072	(36)
Total fabric heat loss	(33) + (36) = 29.8247	(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	12.1958	12.0533	11.9108	11.1983	11.0558	10.3433	10.3433	10.2007	10.6283	11.0558	11.3408	11.6258	(38)
Heat transfer coeff	42.0205	41.8780	41.7355	41.0230	40.8805	40.1679	40.1679	40.0254	40.4529	40.8805	41.1655	41.4505	(39)
Average = Sum(39)m / 12 =												40.9873	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7183	0.7159	0.7134	0.7012	0.6988	0.6866	0.6866	0.6842	0.6915	0.6988	0.7037	0.7086	(40)
HLP (average)												0.7006	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.9389 (42)
Average daily hot water use (litres/day)	84.4730 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	92.9203	89.5414	86.1625	82.7836	79.4046	76.0257	76.0257	79.4046	82.7836	86.1625	89.5414	92.9203	(44)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy conte	137.7982	120.5191	124.3650	108.4244	104.0358	89.7750	83.1897	95.4614	96.6015	112.5798	122.8896	133.4502	(45)
Energy content (annual)										Total = Sum(45)m =		1329.0895	(45)
Distribution loss (46)m = 0.15 x (45)m													
	20.6697	18.0779	18.6547	16.2637	15.6054	13.4662	12.4785	14.3192	14.4902	16.8870	18.4334	20.0175	(46)
Water storage loss:													
Store volume												2.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.7400	(48)
Temperature factor from Table 2b												1.0000	(49)
Enter (49) or (54) in (55)												0.7400	(55)
Total storage loss													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(56)
If cylinder contains dedicated solar storage													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(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													
	184.0006	162.2503	170.5674	153.1364	150.2382	134.4870	129.3921	141.6638	141.3135	158.7822	167.6016	179.6526	(62)
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													
	184.0006	162.2503	170.5674	153.1364	150.2382	134.4870	129.3921	141.6638	141.3135	158.7822	167.6016	179.6526	(64)
								Total per year (kWh/year) = Sum(64)m =				1873.0855	(64)
Heat gains from water heating, kWh/month													
	82.7798	73.4576	78.3133	71.8207	71.5538	65.6198	64.6225	68.7028	67.8896	74.3947	76.6304	81.3341	(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	96.9460	96.9460	96.9460	96.9460	96.9460	96.9460	96.9460	96.9460	96.9460	96.9460	96.9460	96.9460	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	15.0797	13.3937	10.8925	8.2463	6.1642	5.2041	5.6232	7.3092	9.8104	12.4566	14.5387	15.4988	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	169.1487	170.9039	166.4808	157.0644	145.1780	134.0065	126.5432	124.7879	129.2111	138.6274	150.5138	161.6854	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	32.6946	32.6946	32.6946	32.6946	32.6946	32.6946	32.6946	32.6946	32.6946	32.6946	32.6946	32.6946	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-77.5568	-77.5568	-77.5568	-77.5568	-77.5568	-77.5568	-77.5568	-77.5568	-77.5568	-77.5568	-77.5568	-77.5568	(71)
Water heating gains (Table 5)													
	111.2632	109.3119	105.2598	99.7510	96.1745	91.1386	86.8582	92.3425	94.2911	99.9929	106.4311	109.3200	(72)
Total internal gains													
	347.5754	345.6933	334.7168	317.1455	299.6005	282.4329	271.1084	276.5235	285.3964	303.1607	323.5674	338.5880	(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	8.4000	19.6403	0.3700	0.8900	0.7700	37.6488	(80)
West	3.8000	19.6403	0.5600	0.6800	0.7700	19.6952	(80)

Solar gains	57.3441	112.1772	184.7398	269.4320	330.1990	338.0175	321.8064	276.4269	214.8600	133.1077	71.5013	47.1570	(83)
Total gains	404.9194	457.8704	519.4566	586.5775	629.7995	620.4504	592.9148	552.9505	500.2565	436.2683	395.0688	385.7450	(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	111.9136	112.2944	112.6778	114.6350	115.0346	117.0752	117.0752	117.4920	116.2503	115.0346	114.2381	113.4526	
alpha	8.4609	8.4863	8.5119	8.6423	8.6690	8.8050	8.8050	8.8328	8.7500	8.6690	8.6159	8.5635	
util living area													
	0.9959	0.9877	0.9496	0.8078	0.6006	0.4142	0.2981	0.3330	0.5565	0.8846	0.9869	0.9972	(86)
MIT	20.5419	20.6591	20.8281	20.9653	20.9971	20.9999	21.0000	21.0000	20.9988	20.9396	20.7195	20.5207	(87)
Th 2	20.3247	20.3268	20.3290	20.3397	20.3419	20.3527	20.3527	20.3548	20.3483	20.3419	20.3376	20.3333	(88)
util rest of house													
	0.9946	0.9837	0.9355	0.7737	0.5593	0.3724	0.2542	0.2863	0.5046	0.8513	0.9820	0.9962	(89)
MIT 2	19.7163	19.8868	20.1238	20.3049	20.3395	20.3526	20.3527	20.3548	20.3476	20.2813	19.9838	19.6927	(90)
Living area fraction									fLA = Living area / (4) =			0.4821	(91)
MIT	20.1143	20.2591	20.4633	20.6233	20.6565	20.6646	20.6647	20.6658	20.6615	20.5986	20.3384	20.0919	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1143	20.2591	20.4633	20.6233	20.6565	20.6646	20.6647	20.6658	20.6615	20.5986	20.3384	20.0919	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9940	0.9832	0.9386	0.7888	0.5791	0.3926	0.2754	0.3088	0.5296	0.8650	0.9820	0.9957	(94)
Useful gains	402.5046	450.1909	487.5767	462.6642	364.7469	243.5644	163.2695	170.7376	264.9462	377.3909	387.9459	384.1001	(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													
	664.5234	643.2088	582.7669	480.9227	366.1459	243.6038	163.2709	170.7412	265.4338	408.7480	544.9655	658.7253	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	194.9420	129.7080	70.8215	13.1461	1.0409	0.0000	0.0000	0.0000	0.0000	23.3297	113.0541	204.3211	(98)
Space heating												750.3634	(98)
Space heating per m2											(98) / (4) =	12.8267	(99)

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)		0.0000 (301)
Fraction of space heat from community system		1.0000 (302)
Fraction of heat from community Heat pump		0.4600 (303a)
Fraction of heat from community Boilers		0.5400 (303b)
Fraction of total space heat from community Heat pump		0.4600 (304a)
Fraction of total space heat from community Boilers		0.5400 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating		1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating		1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system		1.0500 (306)
Space heating:		
Annual space heating requirement		750.3634 (98)
Space heat from Heat pump = (98) x 0.46 x 1.00 x 1.05		362.4255 (307a)
Space heat from Boilers = (98) x 0.54 x 1.00 x 1.05		425.4561 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0.0000 (308)
Space heating fuel for secondary/supplementary system		0.0000 (309)
Water heating		
Annual water heating requirement		1873.0855 (64)
Water heat from Heat pump = (64) x 0.46 x 1.00 x 1.05		904.7003 (310a)
Water heat from Boilers = (64) x 0.54 x 1.00 x 1.05		1062.0395 (310b)
Electricity used for heat distribution		27.5462 (313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.2500, SFP = 0.6625)		
mechanical ventilation fans (SFP = 0.6625)		120.0979 (330a)
Total electricity for the above, kWh/year		120.0979 (331)
Electricity for lighting (calculated in Appendix L)		266.3127 (332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV Unit 0 (0.80 * 0.49 * 951 * 1.00) =	-372.6415	-372.6415 (333)
Total delivered energy for all uses		2768.3905 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			370.0000	(367a)
Space heating from Heat pump	342.4664	0.5190	177.7401	(367)
Efficiency of heat source Boilers			93.9000	(367b)
Space heating from Boilers	1584.1273	0.2160	342.1715	(368)
Electrical energy for heat distribution	27.5462	0.5190	14.2965	(372)
Total CO2 associated with community systems			534.2081	(373)
(negative value allowed since DFEE <= TFEE)				
Space and water heating			534.2081	(376)
Pumps and fans	120.0979	0.5190	62.3308	(378)
Energy for lighting	266.3127	0.5190	138.2163	(379)
Energy saving/generation technologies				
PV Unit	-372.6415	0.5190	-193.4009	(380)
Total CO2, kg/year			541.3542	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			9.2500	(384)

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

DER		9.2500	ZC1
Total Floor Area	TFA	58.5000	
Assumed number of occupants	N	1.9389	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.1340	ZC2
CO2 emissions from cooking, equation (L16)		2.8296	ZC3
Total CO2 emissions		29.2136	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		29.2136	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	58.5000 (1b)	x	2.5400 (2b)	=	148.5900	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	58.5000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	148.5900	(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)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1346	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3846	(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) =	0.2981	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3800	0.3726	0.3651	0.3279	0.3204	0.2832	0.2832	0.2757	0.2981	0.3204	0.3353	0.3502	(22b)
Effective ac	0.5722	0.5694	0.5667	0.5537	0.5513	0.5401	0.5401	0.5380	0.5444	0.5513	0.5562	0.5613	(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 Semi-glazed door			2.1000	1.2000	2.5200			(26a)
TER Opening Type (Uw = 1.40)			12.2000	1.3258	16.1742			(27)
External Wall 1	37.1000	12.2000	24.9000	0.1800	4.4820			(29a)
Corridor wall	25.4000	2.1000	23.3000	0.1800	4.1940			(29a)
Total net area of external elements Aum(A, m2)			62.5000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.3702			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							2.7572	(36)
Total fabric heat loss					(33) + (36) =		30.1274	(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	28.0582	27.9207	27.7860	27.1529	27.0345	26.4832	26.4832	26.3810	26.6955	27.0345	27.2741	27.5246	(38)
Heat transfer coeff	58.1857	58.0482	57.9134	57.2804	57.1619	56.6106	56.6106	56.5085	56.8230	57.1619	57.4015	57.6520	(39)
Average = Sum(39)m / 12 =												57.2798	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9946	0.9923	0.9900	0.9792	0.9771	0.9677	0.9677	0.9660	0.9713	0.9771	0.9812	0.9855	(40)
HLP (average)												0.9791	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.9389	(42)
Average daily hot water use (litres/day)	80.2494	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	88.2743	85.0643	81.8544	78.6444	75.4344	72.2244	72.2244	75.4344	78.6444	81.8544	85.0643	88.2743	(44)
Energy conte	130.9082	114.4932	118.1467	103.0032	98.8340	85.2862	79.0302	90.6883	91.7714	106.9508	116.7451	126.7776	(45)
Energy content (annual)										Total = Sum(45)m =		1262.6351	(45)
Distribution loss (46)m = 0.15 x (45)m	19.6362	17.1740	17.7220	15.4505	14.8251	12.7929	11.8545	13.6033	13.7657	16.0426	17.5118	19.0166	(46)

Water storage loss:		
Store volume	2.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	0.2388	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.1290	(55)
Total storage loss		

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

	3.9977	3.6109	3.9977	3.8688	3.9977	3.8688	3.9977	3.9977	3.8688	3.9977	3.8688	3.9977 (56)
If cylinder contains dedicated solar storage												
	3.9977	3.6109	3.9977	3.8688	3.9977	3.8688	3.9977	3.9977	3.8688	3.9977	3.8688	3.9977 (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												
	158.1684	139.1153	145.4069	129.3840	126.0941	111.6670	106.2904	117.9485	118.1522	134.2109	143.1259	154.0378 (62)
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												
	158.1684	139.1153	145.4069	129.3840	126.0941	111.6670	106.2904	117.9485	118.1522	134.2109	143.1259	154.0378 (64)
								Total per year (kWh/year) = Sum(64)m =				1583.6013 (64)
Heat gains from water heating, kWh/month												
	65.3351	57.7666	61.0919	55.3532	54.6704	49.4623	48.0857	51.9620	51.6186	57.3692	59.9224	63.9617 (65)

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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	96.9460	96.9460	96.9460	96.9460	96.9460	96.9460	96.9460	96.9460	96.9460	96.9460	96.9460	96.9460	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	15.1287	13.4372	10.9279	8.2731	6.1842	5.2210	5.6415	7.3330	9.8423	12.4971	14.5860	15.5492	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	169.1487	170.9039	166.4808	157.0644	145.1780	134.0065	126.5432	124.7879	129.2111	138.6274	150.5138	161.6854	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	32.6946	32.6946	32.6946	32.6946	32.6946	32.6946	32.6946	32.6946	32.6946	32.6946	32.6946	32.6946	(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)													
	-77.5568	-77.5568	-77.5568	-77.5568	-77.5568	-77.5568	-77.5568	-77.5568	-77.5568	-77.5568	-77.5568	-77.5568	(71)
Water heating gains (Table 5)													
	87.8160	85.9623	82.1128	76.8794	73.4817	68.6976	64.6313	69.8414	71.6925	77.1092	83.2255	85.9700	(72)
Total internal gains													
	327.1772	325.3872	314.6052	297.3008	279.9278	263.0089	251.8997	257.0461	265.8298	283.3175	303.4091	318.2884	(73)

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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	12.2000	19.6403	0.6300	0.7000	0.7700	73.2283	(80)

Solar gains	73.2283	143.2501	235.9125	344.0643	421.6637	431.6479	410.9464	352.9969	274.3760	169.9783	91.3071	60.2194	(83)
Total gains	400.4055	468.6373	550.5177	641.3651	701.5916	694.6568	662.8461	610.0430	540.2058	453.2958	394.7162	378.5078	(84)

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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	69.8196	69.9850	70.1478	70.9231	71.0700	71.7622	71.7622	71.8919	71.4940	71.0700	70.7734	70.4659	
alpha	5.6546	5.6657	5.6765	5.7282	5.7380	5.7841	5.7841	5.7928	5.7663	5.7380	5.7182	5.6977	
util living area													
	0.9961	0.9899	0.9667	0.8823	0.7135	0.5157	0.3750	0.4243	0.6904	0.9403	0.9909	0.9971	(86)
MIT	20.0535	20.2220	20.4914	20.7892	20.9486	20.9933	20.9991	20.9982	20.9683	20.7211	20.3263	20.0217	(87)
Th 2	20.0878	20.0898	20.0917	20.1007	20.1024	20.1103	20.1103	20.1118	20.1073	20.1024	20.0990	20.0954	(88)
util rest of house													
	0.9948	0.9868	0.9565	0.8515	0.6580	0.4466	0.2996	0.3434	0.6146	0.9168	0.9875	0.9962	(89)
MIT 2	18.8288	19.0747	19.4606	19.8691	20.0571	20.1062	20.1100	20.1111	20.0846	19.7927	19.2344	18.7881	(90)
Living area fraction										fLA = Living area / (4) =		0.4821	(91)
MIT	19.4192	19.6278	19.9575	20.3126	20.4869	20.5338	20.5386	20.5387	20.5106	20.2402	19.7608	19.3827	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4192	19.6278	19.9575	20.3126	20.4869	20.5338	20.5386	20.5387	20.5106	20.2402	19.7608	19.3827	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9936	0.9847	0.9547	0.8594	0.6825	0.4798	0.3360	0.3825	0.6500	0.9209	0.9858	0.9952	(94)
Useful gains	397.8464	461.4833	525.6024	551.1703	478.8403	333.3036	222.6952	233.3149	351.1260	417.4595	389.1258	376.6914	(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													
	879.7202	854.9202	779.3700	653.7200	502.2740	335.9174	222.9665	233.8742	364.2687	551.0533	726.7470	875.3156	(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													
	358.5140	264.3896	188.8031	73.8358	17.4347	0.0000	0.0000	0.0000	0.0000	99.3938	243.0872	370.9764	(98)
Space heating												1616.4346	(98)
Space heating per m2											(98) / (4) =	27.6314	(99)

8c. Space cooling requirement

Not applicable

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												1728.8070	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	358.5140	264.3896	188.8031	73.8358	17.4347	0.0000	0.0000	0.0000	0.0000	99.3938	243.0872	370.9764	(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)													
	383.4375	282.7696	201.9284	78.9687	18.6468	0.0000	0.0000	0.0000	0.0000	106.3036	259.9863	396.7662	(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													
	158.1684	139.1153	145.4069	129.3840	126.0941	111.6670	106.2904	117.9485	118.1522	134.2109	143.1259	154.0378	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.9317	86.5012	85.5115	83.3819	80.9628	79.8000	79.8000	79.8000	79.8000	84.0270	86.2159	87.0745	(217)
Fuel for water heating, kWh/month													
	181.9455	160.8246	170.0436	155.1704	155.7433	139.9336	133.1959	147.8051	148.0604	159.7236	166.0087	176.9035	(219)
Water heating fuel used												1895.3584	(219)
Annual totals kWh/year													
Space heating fuel - main system												1728.8070	(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)												267.1781	(232)
Total delivered energy for all uses												3966.3435	(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	1728.8070	0.2160	373.4223	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1895.3584	0.2160	409.3974	(264)
Space and water heating			782.8197	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	267.1781	0.5190	138.6654	(268)
Total CO2, kg/m2/year			960.4102	(272)
Emissions per m2 for space and water heating			13.3815	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.3703	(272b)
Emissions per m2 for pumps and fans			0.6654	(272c)
Target Carbon Dioxide Emission Rate (TER) = (13.3815 * 1.00) + 2.3703 + 0.6654, rounded to 2 d.p.			16.4200	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	A-1-07	**Issued on Date**	05/02/2020
Assessment Reference	ASHP-1-2	**Prop Type Ref**	2bed 3F
Property			

SAP Rating	86 B	**DER**	12.09	**TER**	19.36
Environmental	92 A	**% DER<TER**	37.56		
CO_2 Emissions (t/year)	0.51	**DFEE**	49.09	**TFEE**	53.02
General Requirements Compliance	Fail	**% DFEE<TFEE**	7.42		

Assessor Details	Miss Claudia Cioli, Claudia Cioli, Tel: 07481524839, clacioli@gmail.com	**Assessor ID**	R479-0001
Client			

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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England
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DWELLING AS DESIGNED

Mid-floor flat, total floor area 55 m²

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

1a TER and DER
Fuels for main heating:Mains gas (c), Electricity (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 19.36 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 12.09 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)53.0 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)49.1 kWh/m²/yrOK

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2 Fabric U-values

Element	Average	Highest	
External wall	0.14 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.11 (max. 0.25)	0.11 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction

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

---
4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage Measured cylinder loss: 0.74 kWh/day
Permitted by DBSCG 0.32 Fail
Primary pipework insulated: No primary pipework

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

Hot water controls: No cylinderstat

---
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: 94%
Minimum: 70% OK

---
9 Summertime temperature
Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing North: 8.40 m², No overhang
Windows facing North East: 1.64 m², No overhang
Windows facing South East: 7.61 m², No overhang
Air change rate: 0.50 ach
Blinds/curtains: None

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10 Key features
Party wall U-value 0.00 W/m²K
Exposed floor U-value 0.11 W/m²K
Air permeability 3.0 m³/m²h
Photovoltaic array 0.49 kW

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	54.5000 (1b)	x	2.5400 (2b)	=	138.4300	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	54.5000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	138.4300	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							0 * 10 =	0.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.0000	
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1163	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation:	0.5000	(23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	79.9000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2487	0.2458	0.2429	0.2284	0.2255	0.2109	0.2109	0.2080	0.2168	0.2255	0.2313	0.2371	(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	
W05 (Uw = 1.40)			1.6400	1.3258	2.1742			(27)
W03 (Uw = 1.40)			8.4000	1.3258	11.1364			(27)
W02 (Uw = 1.40)			7.6100	1.3258	10.0890			(27)
door			2.1000	1.4000	2.9400			(26a)
Heat Loss Floor 1			54.5000	0.1100	5.9950			(28b)
External Wall 1	32.4000	17.6500	14.7500	0.1500	2.2125	140.0000	2065.0000	(29a)
Corridor wall	43.3000	2.1000	41.2000	0.1409	5.8055	110.0000	4532.0000	(29a)
Total net area of external elements Aum(A, m2)			130.2000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.3527			(33)
Party Wall 1			19.4000	0.0000	0.0000	140.0000	2716.0000	(32)
Party Ceilings			54.5000			80.0000	4360.0000	(32b)
Internal Wall			73.4000			9.0000	660.6000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 14333.6000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	263.0018	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	5.2116	(36)
Total fabric heat loss	(33) + (36) = 45.5643	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	11.3619	11.2292	11.0964	10.4326	10.2998	9.6360	9.6360	9.5033	9.9016	10.2998	10.5654	10.8309	(38)
Heat transfer coeff	56.9262	56.7934	56.6607	55.9969	55.8641	55.2003	55.2003	55.0675	55.4658	55.8641	56.1296	56.3952	(39)
Average = Sum(39)m / 12 =												55.9637	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0445	1.0421	1.0396	1.0275	1.0250	1.0128	1.0128	1.0104	1.0177	1.0250	1.0299	1.0348	(40)
HLP (average)												1.0269	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.8227 (42)
Average daily hot water use (litres/day)	81.5674 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	89.7241	86.4614	83.1987	79.9360	76.6733	73.4106	73.4106	76.6733	79.9360	83.1987	86.4614	89.7241	(44)
Energy conte	133.0582	116.3736	120.0871	104.6949	100.4572	86.6869	80.3282	92.1778	93.2787	108.7073	118.6625	128.8598	(45)
Energy content (annual)										Total = Sum(45)m =		1283.3722	(45)
Distribution loss (46)m = 0.15 x (45)m													
	19.9587	17.4560	18.0131	15.7042	15.0686	13.0030	12.0492	13.8267	13.9918	16.3061	17.7994	19.3290	(46)
Water storage loss:													
Store volume												2.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.7400	(48)
Temperature factor from Table 2b												1.0000	(49)
Enter (49) or (54) in (55)												0.7400	(55)
Total storage loss													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(56)
If cylinder contains dedicated solar storage													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(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													
	179.2606	158.1048	166.2895	149.4069	146.6596	131.3989	126.5306	138.3802	137.9907	154.9097	163.3745	175.0622	(62)
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													
	179.2606	158.1048	166.2895	149.4069	146.6596	131.3989	126.5306	138.3802	137.9907	154.9097	163.3745	175.0622	(64)
									Total per year (kWh/year) = Sum(64)m =			1827.3682	(64)
Heat gains from water heating, kWh/month													
	81.2038	72.0792	76.8909	70.5806	70.3639	64.5930	63.6710	67.6110	66.7848	73.1071	75.2249	79.8078	(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	91.1347	91.1347	91.1347	91.1347	91.1347	91.1347	91.1347	91.1347	91.1347	91.1347	91.1347	91.1347	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	14.1657	12.5819	10.2323	7.7465	5.7906	4.8887	5.2824	6.8662	9.2158	11.7016	13.6575	14.5594	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	158.8961	160.5450	156.3899	147.5444	136.3784	125.8840	118.8731	117.2242	121.3793	130.2248	141.3908	151.8852	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	32.1135	32.1135	32.1135	32.1135	32.1135	32.1135	32.1135	32.1135	32.1135	32.1135	32.1135	32.1135	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-72.9078	-72.9078	-72.9078	-72.9078	-72.9078	-72.9078	-72.9078	-72.9078	-72.9078	-72.9078	-72.9078	-72.9078	(71)
Water heating gains (Table 5)													
	109.1449	107.2607	103.3480	98.0287	94.5752	89.7125	85.5794	90.8750	92.7566	98.2622	104.4790	107.2686	(72)
Total internal gains													
	332.5471	330.7279	320.3106	303.6599	287.0846	270.8256	260.0752	265.3059	273.6921	290.5291	309.8677	324.0536	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	1.6400	11.2829	0.3700	0.7900	0.7700	3.7482	(75)
North	8.4000	10.6334	0.3700	0.8900	0.7700	20.3834	(74)
Southeast	7.6100	36.7938	0.5600	0.6800	0.7700	73.8907	(77)

Solar gains	98.0223	172.4466	252.1496	342.2747	412.5714	422.9506	402.1702	347.3383	282.8027	194.7990	118.3658	83.2886	(83)
Total gains	430.5694	503.1745	572.4601	645.9346	699.6560	693.7762	662.2454	612.6442	556.4948	485.3280	428.2335	407.3422	(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	69.9424	70.1059	70.2702	71.1032	71.2722	72.1293	72.1293	72.3031	71.7840	71.2722	70.9350	70.6010	
alpha	5.6628	5.6737	5.6847	5.7402	5.7515	5.8086	5.8086	5.8202	5.7856	5.7515	5.7290	5.7067	
util living area													
	0.9938	0.9845	0.9573	0.8712	0.7027	0.5042	0.3661	0.4120	0.6610	0.9168	0.9852	0.9954	(86)
MIT	20.1185	20.2932	20.5383	20.8058	20.9528	20.9941	20.9992	20.9985	20.9748	20.7698	20.3942	20.0845	(87)
Th 2	20.0464	20.0484	20.0504	20.0605	20.0625	20.0726	20.0726	20.0747	20.0686	20.0625	20.0585	20.0545	(88)
util rest of house													
	0.9918	0.9796	0.9442	0.8372	0.6444	0.4335	0.2893	0.3299	0.5826	0.8857	0.9797	0.9938	(89)
MIT 2	18.8872	19.1406	19.4887	19.8520	20.0222	20.0692	20.0724	20.0741	20.0516	19.8178	19.2962	18.8439	(90)
Living area fraction									fLA = Living area / (4) =			0.4624	(91)
MIT	19.4565	19.6735	19.9740	20.2930	20.4525	20.4969	20.5009	20.5016	20.4785	20.2580	19.8039	19.4175	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4565	19.6735	19.9740	20.2930	20.4525	20.4969	20.5009	20.5016	20.4785	20.2580	19.8039	19.4175	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9901	0.9772	0.9430	0.8463	0.6694	0.4661	0.3248	0.3680	0.6181	0.8930	0.9778	0.9925	(94)
Useful gains	426.3166	491.7265	539.8231	546.6573	468.3686	323.3670	215.1203	225.4336	343.9566	433.4008	418.7113	404.2767	(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													
	862.8018	839.0397	763.4457	637.9732	488.9507	325.5098	215.3333	225.8625	353.7873	539.5339	713.0660	858.1947	(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													
	324.7450	233.3945	166.3752	65.7474	15.3131	0.0000	0.0000	0.0000	0.0000	78.9630	211.9354	337.7150	(98)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Space heating			1434.1887 (98)
Space heating per m2	(98) / (4) =		26.3154 (99)

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)			0.0000 (301)
Fraction of space heat from community system			1.0000 (302)
Fraction of heat from community Heat pump			0.4600 (303a)
Fraction of heat from community Boilers			0.5400 (303b)
Fraction of total space heat from community Heat pump			0.4600 (304a)
Fraction of total space heat from community Boilers			0.5400 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating			1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating			1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system			1.0500 (306)
Space heating:			
Annual space heating requirement			1434.1887 (98)
Space heat from Heat pump = (98) x 0.46 x 1.00 x 1.05			692.7131 (307a)
Space heat from Boilers = (98) x 0.54 x 1.00 x 1.05			813.1850 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)			0.0000 (308)
Space heating fuel for secondary/supplementary system			0.0000 (309)
Water heating			
Annual water heating requirement			1827.3682 (64)
Water heat from Heat pump = (64) x 0.46 x 1.00 x 1.05			882.6188 (310a)
Water heat from Boilers = (64) x 0.54 x 1.00 x 1.05			1036.1178 (310b)
Electricity used for heat distribution			34.2463 (313)
Annual totals kWh/year			
Electricity for pumps and fans:			
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.2500, SFP = 0.6625)			
mechanical ventilation fans (SFP = 0.6625)			111.8860 (330a)
Total electricity for the above, kWh/year			111.8860 (331)
Electricity for lighting (calculated in Appendix L)			250.1708 (332)
Energy saving/generation technologies (Appendices M ,N and Q)			
PV Unit 0 (0.80 * 0.49 * 951 * 1.00) =		-372.6415	-372.6415 (333)
Total delivered energy for all uses			3414.0500 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			370.0000	(367a)
Space heating from Heat pump	425.7654	0.5190	220.9722	(367)
Efficiency of heat source Boilers			93.9000	(367b)
Space heating from Boilers	1969.4385	0.2160	425.3987	(368)
Electrical energy for heat distribution	34.2463	0.5190	17.7739	(372)
Total CO2 associated with community systems			664.1448	(373)
(negative value allowed since DFEE <= TFEE)				
Space and water heating			664.1448	(376)
Pumps and fans	111.8860	0.5190	58.0689	(378)
Energy for lighting	250.1708	0.5190	129.8386	(379)
Energy saving/generation technologies				
PV Unit	-372.6415	0.5190	-193.4009	(380)
Total CO2, kg/year			658.6514	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			12.0900	(384)

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

DER		12.0900	ZC1
Total Floor Area	TFA	54.5000	
Assumed number of occupants	N	1.8227	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.2768	ZC2
CO2 emissions from cooking, equation (L16)		2.9861	ZC3
Total CO2 emissions		32.3529	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		32.3529	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	54.5000 (1b)	x	2.5400 (2b)	=	138.4300	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	54.5000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	138.4300	(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)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1445	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3945	(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) =	0.3057	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3898	0.3821	0.3745	0.3363	0.3286	0.2904	0.2904	0.2828	0.3057	0.3286	0.3439	0.3592	(22b)
Effective ac	0.5760	0.5730	0.5701	0.5565	0.5540	0.5422	0.5422	0.5400	0.5467	0.5540	0.5591	0.5645	(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 Semi-glazed door			2.1000	1.2000	2.5200			(26a)
TER Opening Type (Uw = 1.40)			11.5200	1.3258	15.2727			(27)
Heat Loss Floor 1			54.5000	0.1300	7.0850			(28b)
External Wall 1	32.4000	11.5200	20.8800	0.1800	3.7584			(29a)
Corridor wall	43.3000	2.1000	41.2000	0.1800	7.4160			(29a)
Total net area of external elements Aum(A, m2)			130.2000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.0521			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	3.1241	(36)
Total fabric heat loss (33) + (36) =	39.1762	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.3114	26.1766	26.0445	25.4241	25.3080	24.7676	24.7676	24.6676	24.9758	25.3080	25.5428	25.7883	(38)
Heat transfer coeff	65.4876	65.3528	65.2207	64.6003	64.4842	63.9439	63.9439	63.8438	64.1520	64.4842	64.7191	64.9646	(39)
Average = Sum(39)m / 12 =												64.5998	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2016	1.1991	1.1967	1.1853	1.1832	1.1733	1.1733	1.1714	1.1771	1.1832	1.1875	1.1920	(40)
HLP (average)												1.1853	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.8227	(42)
Average daily hot water use (litres/day)	77.4890	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	85.2379	82.1383	79.0388	75.9392	72.8397	69.7401	69.7401	72.8397	75.9392	79.0388	82.1383	85.2379	(44)
Energy conte	126.4053	110.5549	114.0828	99.4601	95.4343	82.3526	76.3118	87.5689	88.6147	103.2719	112.7294	122.4168	(45)
Energy content (annual)										Total = Sum(45)m =		1219.2036	(45)
Distribution loss (46)m = 0.15 x (45)m	18.9608	16.5832	17.1124	14.9190	14.3152	12.3529	11.4468	13.1353	13.2922	15.4908	16.9094	18.3625	(46)

Water storage loss:		
Store volume	2.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	0.2388	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.1290	(55)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss
3.9977 3.6109 3.9977 3.8688 3.9977 3.8688 3.9977 3.9977 3.8688 3.9977 3.8688 3.9977 (56)
If cylinder contains dedicated solar storage
3.9977 3.6109 3.9977 3.8688 3.9977 3.8688 3.9977 3.9977 3.8688 3.9977 3.8688 3.9977 (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
153.6655 135.1770 141.3429 125.8409 122.6945 108.7334 103.5719 114.8290 114.9955 130.5321 139.1102 149.6770 (62)
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
153.6655 135.1770 141.3429 125.8409 122.6945 108.7334 103.5719 114.8290 114.9955 130.5321 139.1102 149.6770 (64)
Total per year (kWh/year) = Sum(64)m = 1540.1698 (64)
Heat gains from water heating, kWh/month
63.8379 56.4572 59.7406 54.1751 53.5400 48.4869 47.1818 50.9248 50.5690 56.1460 58.5871 62.5117 (65)

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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	91.1347	91.1347	91.1347	91.1347	91.1347	91.1347	91.1347	91.1347	91.1347	91.1347	91.1347	91.1347	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
14.1983 12.6108 10.2558 7.7643 5.8039 4.8999 5.2945 6.8820 9.2370 11.7285 13.6889 14.5929 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
158.8961 160.5450 156.3899 147.5444 136.3784 125.8840 118.8731 117.2242 121.3793 130.2248 141.3908 151.8852 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
32.1135 32.1135 32.1135 32.1135 32.1135 32.1135 32.1135 32.1135 32.1135 32.1135 32.1135 32.1135 (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)
-72.9078 -72.9078 -72.9078 -72.9078 -72.9078 -72.9078 -72.9078 -72.9078 -72.9078 -72.9078 -72.9078 -72.9078 (71)
Water heating gains (Table 5)
85.8036 84.0136 80.2965 75.2432 71.9624 67.3429 63.4164 68.4473 70.2348 75.4651 81.3710 84.0211 (72)
Total internal gains
312.2384 310.5098 300.2827 283.8923 267.4851 251.4672 240.9244 245.8939 254.1914 270.7588 289.7911 303.8396 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	5.4800	10.6334	0.6300	0.7000	0.7700	17.8084	(74)
Northeast	1.0700	11.2829	0.6300	0.7000	0.7700	3.6896	(75)
Southeast	4.9700	36.7938	0.6300	0.7000	0.7700	55.8860	(77)

Solar gains	77.3840	136.7376	201.6104	276.4969	335.7665	345.2594	327.8724	281.5311	227.0507	154.8999	93.5500	65.6858	(83)
Total gains	389.6224	447.2474	501.8931	560.3892	603.2516	596.7265	568.7967	527.4250	481.2421	425.6588	383.3411	369.5255	(84)

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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	57.7930	57.9121	58.0294	58.5867	58.6922	59.1882	59.1882	59.2810	58.9962	58.6922	58.4793	58.2583	
alpha	4.8529	4.8608	4.8686	4.9058	4.9128	4.9459	4.9459	4.9521	4.9331	4.9128	4.8986	4.8839	
util living area	0.9957	0.9910	0.9780	0.9357	0.8284	0.6485	0.4868	0.5428	0.7949	0.9580	0.9912	0.9967	(86)
MIT	19.7952	19.9599	20.2228	20.5594	20.8288	20.9618	20.9924	20.9873	20.8969	20.5498	20.1106	19.7634	(87)
Th 2	19.9187	19.9207	19.9226	19.9318	19.9335	19.9414	19.9414	19.9429	19.9384	19.9335	19.9300	19.9264	(88)
util rest of house	0.9943	0.9880	0.9704	0.9133	0.7738	0.5563	0.3738	0.4251	0.7135	0.9387	0.9877	0.9955	(89)
MIT 2	18.3298	18.5704	18.9507	19.4281	19.7726	19.9173	19.9388	19.9380	19.8601	19.4260	18.7976	18.2888	(90)
Living area fraction									fLA = Living area / (4) =			0.4624	(91)
MIT	19.0074	19.2129	19.5389	19.9512	20.2610	20.4003	20.4259	20.4232	20.3395	19.9456	19.4047	18.9706	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0074	19.2129	19.5389	19.9512	20.2610	20.4003	20.4259	20.4232	20.3395	19.9456	19.4047	18.9706	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9926	0.9854	0.9671	0.9138	0.7920	0.5977	0.4263	0.4798	0.7469	0.9390	0.9854	0.9942	(94)
Useful gains	386.7367	440.6969	485.3604	512.0889	477.7910	356.6914	242.4835	253.0661	359.4495	399.6819	377.7319	367.3677	(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	963.1533	935.3876	850.4056	713.9113	552.0468	370.8910	244.6460	256.8545	400.2780	602.6431	796.3496	959.5682	(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	428.8539	332.4322	271.5936	145.3122	55.2463	0.0000	0.0000	0.0000	0.0000	151.0031	301.4047	440.5971	(98)
Space heating												2126.4432	(98)
Space heating per m2											(98) / (4) =	39.0173	(99)

8c. Space cooling requirement

Not applicable

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												2274.2708	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	428.8539	332.4322	271.5936	145.3122	55.2463	0.0000	0.0000	0.0000	0.0000	151.0031	301.4047	440.5971	(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)													
	458.6673	355.5425	290.4745	155.4141	59.0870	0.0000	0.0000	0.0000	0.0000	161.5007	322.3580	471.2269	(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													
	153.6655	135.1770	141.3429	125.8409	122.6945	108.7334	103.5719	114.8290	114.9955	130.5321	139.1102	149.6770	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.4083	87.1230	86.5287	85.1983	82.8409	79.8000	79.8000	79.8000	79.8000	85.2031	86.8236	87.5242	(217)
Fuel for water heating, kWh/month													
	175.8020	155.1565	163.3480	147.7036	148.1085	136.2574	129.7894	143.8960	144.1047	153.2011	160.2215	171.0122	(219)
Water heating fuel used												1828.6007	(219)
Annual totals kWh/year													
Space heating fuel - main system												2274.2708	(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)												250.7461	(232)
Total delivered energy for all uses												4428.6177	(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	2274.2708	0.2160	491.2425	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1828.6007	0.2160	394.9778	(264)
Space and water heating			886.2203	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	250.7461	0.5190	130.1372	(268)
Total CO2, kg/m2/year			1055.2825	(272)
Emissions per m2 for space and water heating			16.2609	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.3878	(272b)
Emissions per m2 for pumps and fans			0.7142	(272c)
Target Carbon Dioxide Emission Rate (TER) = (16.2609 * 1.00) + 2.3878 + 0.7142, rounded to 2 d.p.			19.3600	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	A-2-01	**Issued on Date**	05/02/2020
Assessment Reference	ASHP-1-2	**Prop Type Ref**	2bed 3F
Property			

SAP Rating	87 B	**DER**	9.53	**TER**	15.61
Environmental	93 A	**% DER<TER**	38.97		
CO_2 Emissions (t/year)	0.52	**DFEE**	37.14	**TFEE**	40.71
General Requirements Compliance	Fail	**% DFEE<TFEE**	8.76		

Assessor Details	Miss Claudia Cioli, Claudia Cioli, Tel: 07481524839, clacioli@gmail.com	**Assessor ID**	R479-0001
Client			

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

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DWELLING AS DESIGNED

Mid-floor flat, total floor area 71 m²

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

1a TER and DER
Fuels for main heating:Mains gas (c), Electricity (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 15.61 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 9.53 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)40.7 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)37.1 kWh/m²/yrOK

---
2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.38 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction

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

---
4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage Measured cylinder loss: 0.74 kWh/day
Permitted by DBSCG 0.32 Fail
Primary pipework insulated: No primary pipework

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

Hot water controls: No cylinderstat

---
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: 94%
Minimum: 70% OK

---
9 Summertime temperature
Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing North East: 1.92 m², No overhang
Windows facing West: 16.01 m², No overhang
Air change rate: 0.50 ach
Blinds/curtains: None

---
10 Key features
Party wall U-value 0.00 W/m²K
Air permeability 3.0 m³/m²h
Photovoltaic array 0.49 kW

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	70.8000 (1b)	x	2.5400 (2b)	=	179.8320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.8000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	179.8320	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							0 * 10 =	0.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.0000	
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	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) =	79.9000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2631	0.2599	0.2567	0.2408	0.2376	0.2216	0.2216	0.2184	0.2280	0.2376	0.2439	0.2503	(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	
W03 (Uw = 1.40)			8.4000	1.3258	11.1364			(27)
W02 (Uw = 1.40)			7.6100	1.3258	10.0890			(27)
door			2.1000	1.2500	2.6250			(26a)
W10 (Uw = 1.40)			1.9200	1.3258	2.5455			(27)
External Wall 1	54.1000	17.9300	36.1700	0.1500	5.4255	140.0000	5063.8000	(29a)
Corridor wall	9.1000	2.1000	7.0000	0.1409	0.9864	110.0000	770.0000	(29a)
Total net area of external elements Aum(A, m2)			63.2000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.8077			(33)
Party Wall 1			36.5000	0.0000	0.0000	140.0000	5110.0000	(32)
Party Floor			70.8000			80.0000	5664.0000	(32d)
Party Ceilings			70.8000			80.0000	5664.0000	(32b)
Internal Wall			126.6000			9.0000	1139.4000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 23411.2000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	330.6667	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	5.9440	(36)
Total fabric heat loss	(33) + (36) = 38.7517	(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	15.6113	15.4222	15.2330	14.2872	14.0980	13.1522	13.1522	12.9631	13.5306	14.0980	14.4764	14.8547	(38)
Heat transfer coeff	54.3630	54.1739	53.9847	53.0389	52.8498	51.9040	51.9040	51.7148	52.2823	52.8498	53.2281	53.6064	(39)
Average = Sum(39)m / 12 =												52.9916	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7678	0.7652	0.7625	0.7491	0.7465	0.7331	0.7331	0.7304	0.7385	0.7465	0.7518	0.7572	(40)
HLP (average)												0.7485	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2654 (42)
Average daily hot water use (litres/day)	92.6347 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	101.8982	98.1928	94.4874	90.7820	87.0766	83.3713	83.3713	87.0766	90.7820	94.4874	98.1928	101.8982	(44)
Energy conte	151.1121	132.1636	136.3810	118.9003	114.0876	98.4490	91.2274	104.6848	105.9351	123.4571	134.7631	146.3440	(45)
Energy content (annual)										Total = Sum(45)m =		1457.5051	(45)
Distribution loss (46)m = 0.15 x (45)m													
	22.6668	19.8245	20.4572	17.8350	17.1131	14.7673	13.6841	15.7027	15.8903	18.5186	20.2145	21.9516	(46)
Water storage loss:													
Store volume												2.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.7400	(48)
Temperature factor from Table 2b												1.0000	(49)
Enter (49) or (54) in (55)												0.7400	(55)
Total storage loss													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(56)
If cylinder contains dedicated solar storage													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(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													
	197.3145	173.8948	182.5834	163.6123	160.2900	143.1610	137.4298	150.8872	150.6471	169.6595	179.4751	192.5464	(62)
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													
	197.3145	173.8948	182.5834	163.6123	160.2900	143.1610	137.4298	150.8872	150.6471	169.6595	179.4751	192.5464	(64)
								Total per year (kWh/year) = Sum(64)m =				2001.5011	(64)
Heat gains from water heating, kWh/month													
	87.2067	77.3294	82.3086	75.3039	74.8961	68.5039	67.2950	71.7696	70.9930	78.0114	80.5783	85.6213	(65)

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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	113.2695	113.2695	113.2695	113.2695	113.2695	113.2695	113.2695	113.2695	113.2695	113.2695	113.2695	113.2695	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	17.7550	15.7698	12.8249	9.7093	7.2578	6.1273	6.6208	8.6060	11.5509	14.6665	17.1180	18.2485	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	199.1570	201.2236	196.0158	184.9289	170.9337	157.7803	148.9929	146.9263	152.1341	163.2210	177.2161	190.3696	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.3269	34.3269	34.3269	34.3269	34.3269	34.3269	34.3269	34.3269	34.3269	34.3269	34.3269	34.3269	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	(71)
Water heating gains (Table 5)													
	117.2133	115.0735	110.6298	104.5888	100.6667	95.1443	90.4503	96.4645	98.6014	104.8540	111.9143	115.0824	(72)
Total internal gains													
	391.1061	389.0477	376.4513	356.2078	335.8391	316.0327	303.0449	308.9776	319.2673	339.7224	363.2293	380.6813	(73)

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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	8.4000	19.6403	0.3700	0.8900	0.7700	37.6488	(80)
West	7.6100	19.6403	0.5600	0.6800	0.7700	39.4423	(80)
Northeast	1.9200	11.2829	0.3700	0.6500	0.7700	3.6105	(75)

Solar gains	80.7017	158.1560	261.5982	383.9597	473.1374	485.5805	461.7763	394.8582	304.9841	187.9262	100.6666	66.3445	(83)
Total gains	471.8078	547.2037	638.0495	740.1675	808.9765	801.6132	764.8212	703.8358	624.2513	527.6486	463.8959	447.0259	(84)

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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	119.6238	120.0415	120.4621	122.6102	123.0490	125.2913	125.2913	125.7495	124.3846	123.0490	122.1745	121.3122	
alpha	8.9749	9.0028	9.0308	9.1740	9.2033	9.3528	9.3528	9.3833	9.2923	9.2033	9.1450	9.0875	
util living area													
	0.9986	0.9943	0.9665	0.8264	0.6051	0.4143	0.2986	0.3380	0.5764	0.9194	0.9947	0.9991	(86)
MIT	20.5114	20.6327	20.8140	20.9662	20.9978	20.9999	21.0000	21.0000	20.9989	20.9275	20.6877	20.4912	(87)
Th 2	20.2813	20.2836	20.2860	20.2976	20.3000	20.3117	20.3117	20.3140	20.3070	20.3000	20.2953	20.2906	(88)
util rest of house													
	0.9981	0.9921	0.9548	0.7900	0.5606	0.3698	0.2519	0.2876	0.5193	0.8885	0.9922	0.9988	(89)
MIT 2	19.6292	19.8073	20.0645	20.2651	20.2983	20.3117	20.3117	20.3140	20.3064	20.2279	19.8976	19.6076	(90)
Living area fraction									fLA = Living area / (4) =			0.3559	(91)
MIT	19.9432	20.1011	20.3313	20.5146	20.5473	20.5566	20.5567	20.5582	20.5529	20.4769	20.1788	19.9221	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9432	20.1011	20.3313	20.5146	20.5473	20.5566	20.5567	20.5582	20.5529	20.4769	20.1788	19.9221	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9977	0.9914	0.9557	0.8016	0.5764	0.3857	0.2685	0.3055	0.5396	0.8971	0.9917	0.9985	(94)
Useful gains	470.7432	542.4931	609.7647	593.3489	466.3018	309.1474	205.3663	215.0373	336.8621	473.3328	460.0529	446.3649	(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													
	850.4115	823.5030	746.6776	616.0268	467.5772	309.1730	205.3670	215.0395	337.3724	521.9926	696.1603	842.8051	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	282.4732	188.8386	101.8632	16.3281	0.9489	0.0000	0.0000	0.0000	0.0000	36.2029	169.9973	294.9515	(98)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Space heating		1091.6038 (98)
Space heating per m2	(98) / (4) =	15.4181 (99)

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.4600 (303a)
Fraction of heat from community Boilers	0.5400 (303b)
Fraction of total space heat from community Heat pump	0.4600 (304a)
Fraction of total space heat from community Boilers	0.5400 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	1091.6038 (98)
Space heat from Heat pump = (98) x 0.46 x 1.00 x 1.05	527.2446 (307a)
Space heat from Boilers = (98) x 0.54 x 1.00 x 1.05	618.9393 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2001.5011 (64)
Water heat from Heat pump = (64) x 0.46 x 1.00 x 1.05	966.7250 (310a)
Water heat from Boilers = (64) x 0.54 x 1.00 x 1.05	1134.8511 (310b)
Electricity used for heat distribution	32.4776 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.2500, SFP = 0.6625)	
mechanical ventilation fans (SFP = 0.6625)	145.3492 (330a)
Total electricity for the above, kWh/year	145.3492 (331)
Electricity for lighting (calculated in Appendix L)	313.5586 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV Unit 0 (0.80 * 0.49 * 951 * 1.00) = -372.6415	-372.6415 (333)
Total delivered energy for all uses	3334.0265 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			370.0000	(367a)
Space heating from Heat pump	403.7756	0.5190	209.5595	(367)
Efficiency of heat source Boilers			93.9000	(367b)
Space heating from Boilers	1867.7214	0.2160	403.4278	(368)
Electrical energy for heat distribution	32.4776	0.5190	16.8559	(372)
Total CO2 associated with community systems			629.8432	(373)
(negative value allowed since DFEE <= TFEE)				
Space and water heating			629.8432	(376)
Pumps and fans	145.3492	0.5190	75.4362	(378)
Energy for lighting	313.5586	0.5190	162.7369	(379)
Energy saving/generation technologies				
PV Unit	-372.6415	0.5190	-193.4009	(380)
Total CO2, kg/year			674.6155	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			9.5300	(384)

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

DER		9.5300	ZC1
Total Floor Area	TFA	70.8000	
Assumed number of occupants	N	2.2654	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.6690	ZC2
CO2 emissions from cooking, equation (L16)		2.4487	ZC3
Total CO2 emissions		28.6477	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		28.6477	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	70.8000 (1b)	x	2.5400 (2b)	=	179.8320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.8000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	179.8320	(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							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) =	0.1668	(8)
Pressure test			Yes	
Measured/design AP50			5.0000	
Infiltration rate			0.4168	(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) =		0.3543	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4517	0.4429	0.4340	0.3897	0.3809	0.3366	0.3366	0.3277	0.3543	0.3809	0.3986	0.4163	(22b)
Effective ac	0.6020	0.5981	0.5942	0.5759	0.5725	0.5566	0.5566	0.5537	0.5628	0.5725	0.5794	0.5867	(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 Semi-glazed door			2.1000	1.2000	2.5200			(26a)
TER Opening Type (Uw = 1.40)			15.6000	1.3258	20.6818			(27)
External Wall 1	54.1000	15.6000	38.5000	0.1800	6.9300			(29a)
Corridor wall	9.1000	2.1000	7.0000	0.1800	1.2600			(29a)
Total net area of external elements Aum(A, m2)			63.2000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		31.3918			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							3.8265	(36)
Total fabric heat loss					(33) + (36) =		35.2183	(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	35.7272	35.4921	35.2617	34.1792	33.9766	33.0338	33.0338	32.8592	33.3970	33.9766	34.3863	34.8147	(38)
Heat transfer coeff	70.9456	70.7104	70.4800	69.3975	69.1949	68.2521	68.2521	68.0775	68.6153	69.1949	69.6047	70.0330	(39)
Average = Sum(39)m / 12 =												69.3965	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0021	0.9987	0.9955	0.9802	0.9773	0.9640	0.9640	0.9615	0.9691	0.9773	0.9831	0.9892	(40)
HLP (average)												0.9802	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.2654 (42)
Average daily hot water use (litres/day)		88.0030 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	96.8033	93.2832	89.7631	86.2429	82.7228	79.2027	79.2027	82.7228	86.2429	89.7631	93.2832	96.8033	(44)
Energy conte	143.5565	125.5554	129.5620	112.9552	108.3833	93.5265	86.6661	99.4506	100.6383	117.2843	128.0249	139.0268	(45)
Energy content (annual)										Total = Sum(45)m =		1384.6298	(45)
Distribution loss (46)m = 0.15 x (45)m	21.5335	18.8333	19.4343	16.9433	16.2575	14.0290	12.9999	14.9176	15.0957	17.5926	19.2037	20.8540	(46)

Water storage loss:	
Store volume	2.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	0.2388 (48)
Temperature factor from Table 2b	0.5400 (49)
Enter (49) or (54) in (55)	0.1290 (55)
Total storage loss	

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

	3.9977	3.6109	3.9977	3.8688	3.9977	3.8688	3.9977	3.9977	3.8688	3.9977	3.8688	3.9977	(56)
If cylinder contains dedicated solar storage													
	3.9977	3.6109	3.9977	3.8688	3.9977	3.8688	3.9977	3.9977	3.8688	3.9977	3.8688	3.9977	(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													
	170.8166	150.1775	156.8221	139.3360	135.6434	119.9073	113.9262	126.7107	127.0191	144.5444	154.4057	166.2869	(62)
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													
	170.8166	150.1775	156.8221	139.3360	135.6434	119.9073	113.9262	126.7107	127.0191	144.5444	154.4057	166.2869	(64)
								Total per year (kWh/year) = Sum(64)m =				1705.5960	(64)
Heat gains from water heating, kWh/month													
	69.5406	61.4448	64.8875	58.6622	57.8455	52.2022	50.6246	54.8754	54.5669	60.8051	63.6729	68.0345	(65)

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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	113.2695	113.2695	113.2695	113.2695	113.2695	113.2695	113.2695	113.2695	113.2695	113.2695	113.2695	113.2695	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	17.7603	15.7745	12.8287	9.7121	7.2599	6.1291	6.6228	8.6085	11.5543	14.6709	17.1231	18.2539	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	199.1570	201.2236	196.0158	184.9289	170.9337	157.7803	148.9929	146.9263	152.1341	163.2210	177.2161	190.3696	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.3269	34.3269	34.3269	34.3269	34.3269	34.3269	34.3269	34.3269	34.3269	34.3269	34.3269	34.3269	(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)													
	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	(71)
Water heating gains (Table 5)													
	93.4686	91.4358	87.2143	81.4753	77.7494	72.5030	68.0438	73.7573	75.7873	81.7273	88.4346	91.4443	(72)
Total internal gains													
	370.3667	368.4147	356.0396	336.0972	315.9239	296.3933	283.6403	289.2729	299.4566	319.6000	342.7547	360.0486	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	1.6700	11.2829	0.6300	0.7000	0.7700	5.7585	(75)
West	13.9300	19.6403	0.6300	0.7000	0.7700	83.6123	(80)

Solar gains	89.3708	175.2851	290.4843	427.5366	528.0776	542.5594	515.7156	440.1199	339.0168	208.4065	111.5004	73.4614	(83)
Total gains	459.7375	543.6997	646.5239	763.6339	844.0015	838.9527	799.3559	729.3928	638.4734	528.0066	454.2551	433.5100	(84)

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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	69.3020	69.5324	69.7598	70.8479	71.0553	72.0368	72.0368	72.2216	71.6556	71.0553	70.6370	70.2050	
alpha	5.6201	5.6355	5.6507	5.7232	5.7370	5.8025	5.8025	5.8148	5.7770	5.7370	5.7091	5.6803	
util living area													
	0.9970	0.9918	0.9710	0.8885	0.7169	0.5149	0.3749	0.4275	0.7023	0.9485	0.9929	0.9978	(86)
MIT	20.0097	20.1827	20.4620	20.7793	20.9474	20.9934	20.9991	20.9982	20.9656	20.7003	20.2934	19.9833	(87)
Th 2	20.0816	20.0844	20.0871	20.0999	20.1023	20.1134	20.1134	20.1155	20.1091	20.1023	20.0974	20.0924	(88)
util rest of house													
	0.9960	0.9892	0.9619	0.8587	0.6614	0.4462	0.2998	0.3463	0.6265	0.9275	0.9902	0.9971	(89)
MIT 2	18.7604	19.0138	19.4160	19.8562	20.0557	20.1094	20.1131	20.1148	20.0844	19.7657	19.1859	18.7299	(90)
Living area fraction									fLA = Living area / (4) =			0.3559	(91)
MIT	19.2051	19.4298	19.7883	20.1848	20.3731	20.4241	20.4285	20.4292	20.3981	20.0984	19.5801	19.1760	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2051	19.4298	19.7883	20.1848	20.3731	20.4241	20.4285	20.4292	20.3981	20.0984	19.5801	19.1760	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9947	0.9868	0.9583	0.8618	0.6788	0.4705	0.3266	0.3753	0.6521	0.9274	0.9881	0.9961	(94)
Useful gains	457.3197	536.5045	619.5700	658.0832	572.8788	394.7450	261.0338	273.7189	416.3766	489.6704	448.8341	431.8233	(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													
	1057.4477	1027.4111	936.5568	783.1358	600.1338	397.5050	261.3016	274.2999	432.1429	657.2397	868.6738	1048.8165	(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													
	446.4952	329.8893	235.8382	90.0379	20.2777	0.0000	0.0000	0.0000	0.0000	124.6716	302.2846	459.0429	(98)
Space heating												2008.5374	(98)
Space heating per m2											(98) / (4) =	28.3692	(99)

8c. Space cooling requirement

Not applicable

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												2148.1683	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	446.4952	329.8893	235.8382	90.0379	20.2777	0.0000	0.0000	0.0000	0.0000	124.6716	302.2846	459.0429	(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)													
	477.5350	352.8227	252.2333	96.2972	21.6874	0.0000	0.0000	0.0000	0.0000	133.3386	323.2990	490.9550	(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													
	170.8166	150.1775	156.8221	139.3360	135.6434	119.9073	113.9262	126.7107	127.0191	144.5444	154.4057	166.2869	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.2623	86.8568	85.8999	83.6838	81.0462	79.8000	79.8000	79.8000	79.8000	84.4223	86.5752	87.3842	(217)
Fuel for water heating, kWh/month													
	195.7507	172.9025	182.5637	166.5030	167.3656	150.2598	142.7647	158.7853	159.1718	171.2159	178.3487	190.2940	(219)
Water heating fuel used												2035.9255	(219)
Annual totals kWh/year													
Space heating fuel - main system												2148.1683	(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)												313.6516	(232)
Total delivered energy for all uses												4572.7454	(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	2148.1683	0.2160	464.0044	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2035.9255	0.2160	439.7599	(264)
Space and water heating			903.7643	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	313.6516	0.5190	162.7852	(268)
Total CO2, kg/m2/year			1105.4744	(272)
Emissions per m2 for space and water heating			12.7650	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.2992	(272b)
Emissions per m2 for pumps and fans			0.5498	(272c)
Target Carbon Dioxide Emission Rate (TER) = (12.7650 * 1.00) + 2.2992 + 0.5498, rounded to 2 d.p.			15.6100	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	A-2-04	**Issued on Date**	05/02/2020
Assessment Reference	ASHP-1-2	**Prop Type Ref**	2bed 3F
Property			

SAP Rating	87 B	**DER**	9.53	**TER**	16.65
Environmental	94 A	**% DER<TER**	42.75		
CO_2 Emissions (t/year)	0.41	**DFEE**	35.89	**TFEE**	39.15
General Requirements Compliance	Fail	**% DFEE<TFEE**	8.32		

Assessor Details	Miss Claudia Cioli, Claudia Cioli, Tel: 07481524839, clacioli@gmail.com	**Assessor ID**	R479-0001
Client			

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

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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England
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DWELLING AS DESIGNED

Mid-floor flat, total floor area 54 m²

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

1a TER and DER
Fuels for main heating:Mains gas (c), Electricity (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 16.65 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 9.53 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)39.1 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)35.9 kWh/m²/yrOK

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2 Fabric U-values

Element	Average	Highest	
External wall	0.14 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction

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

---
4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage Measured cylinder loss: 0.74 kWh/day
Permitted by DBSCG 0.32 Fail
Primary pipework insulated: No primary pipework

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

Hot water controls: No cylinderstat

---
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: 94%
Minimum: 70% OK

---
9 Summertime temperature
Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing North East: 1.64 m², No overhang
Windows facing South East: 12.20 m², No overhang
Air change rate: 0.50 ach
Blinds/curtains: None

---
10 Key features
Party wall U-value 0.00 W/m²K
Air permeability 3.0 m³/m²h
Photovoltaic array 0.49 kW

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	54.1000 (1b)	x	2.5400 (2b)	=	137.4140	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	54.1000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	137.4140	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							0 * 10 =	0.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.0000	
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1163	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation:	0.5000	(23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	79.9000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2487	0.2458	0.2429	0.2284	0.2255	0.2109	0.2109	0.2080	0.2168	0.2255	0.2313	0.2371	(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	
W05 (Uw = 1.40)			1.6400	1.3258	2.1742			(27)
W03 (Uw = 1.40)			8.4000	1.3258	11.1364			(27)
W02 (Uw = 1.40)			3.8000	1.3258	5.0379			(27)
door			2.1000	1.4000	2.9400			(26a)
External Wall 1	31.5800	13.8400	17.7400	0.1500	2.6610	140.0000	2483.6000	(29a)
Corridor wall	41.5500	2.1000	39.4500	0.1409	5.5589	110.0000	4339.5000	(29a)
Total net area of external elements Aum(A, m2)			73.1300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.5084			(33)
Party Wall 1			14.9000	0.0000	0.0000	140.0000	2086.0000	(32)
Party Floor			54.1000			80.0000	4328.0000	(32d)
Party Ceilings			54.1000			80.0000	4328.0000	(32b)
Internal Wall			82.3000			9.0000	740.7000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 18305.8000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	338.3697	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	4.1024	(36)
Total fabric heat loss	(33) + (36) = 33.6108	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	11.2786	11.1468	11.0150	10.3560	10.2242	9.5653	9.5653	9.4335	9.8289	10.2242	10.4878	10.7514	(38)
Heat transfer coeff	44.8894	44.7576	44.6258	43.9669	43.8351	43.1761	43.1761	43.0443	43.4397	43.8351	44.0987	44.3622	(39)
Average = Sum(39)m / 12 =												43.9339	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8297	0.8273	0.8249	0.8127	0.8103	0.7981	0.7981	0.7956	0.8030	0.8103	0.8151	0.8200	(40)
HLP (average)												0.8121	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.8109 (42)
Average daily hot water use (litres/day)	81.2736 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	89.4009	86.1500	82.8991	79.6481	76.3972	73.1462	73.1462	76.3972	79.6481	82.8991	86.1500	89.4009	(44)
Energy conte	132.5790	115.9545	119.6546	104.3178	100.0954	86.3747	80.0389	91.8458	92.9427	108.3158	118.2351	128.3957	(45)
Energy content (annual)										Total = Sum(45)m =		1278.7499	(45)
Distribution loss (46)m = 0.15 x (45)m													
	19.8869	17.3932	17.9482	15.6477	15.0143	12.9562	12.0058	13.7769	13.9414	16.2474	17.7353	19.2594	(46)
Water storage loss:													
Store volume												2.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.7400	(48)
Temperature factor from Table 2b												1.0000	(49)
Enter (49) or (54) in (55)												0.7400	(55)
Total storage loss													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(56)
If cylinder contains dedicated solar storage													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(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													
	178.7814	157.6857	165.8570	149.0298	146.2978	131.0867	126.2413	138.0482	137.6547	154.5182	162.9471	174.5981	(62)
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													
	178.7814	157.6857	165.8570	149.0298	146.2978	131.0867	126.2413	138.0482	137.6547	154.5182	162.9471	174.5981	(64)
									Total per year (kWh/year) = Sum(64)m =			1822.7459	(64)
Heat gains from water heating, kWh/month													
	81.0444	71.9398	76.7471	70.4553	70.2436	64.4892	63.5748	67.5006	66.6731	72.9769	75.0828	79.6535	(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	90.5472	90.5472	90.5472	90.5472	90.5472	90.5472	90.5472	90.5472	90.5472	90.5472	90.5472	90.5472	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	14.0736	12.5001	10.1657	7.6961	5.7529	4.8569	5.2480	6.8216	9.1559	11.6255	13.5687	14.4648	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	157.8632	159.5014	155.3733	146.5853	135.4919	125.0657	118.1003	116.4622	120.5902	129.3783	140.4717	150.8979	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	32.0547	32.0547	32.0547	32.0547	32.0547	32.0547	32.0547	32.0547	32.0547	32.0547	32.0547	32.0547	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-72.4377	-72.4377	-72.4377	-72.4377	-72.4377	-72.4377	-72.4377	-72.4377	-72.4377	-72.4377	-72.4377	-72.4377	(71)
Water heating gains (Table 5)													
	108.9307	107.0533	103.1547	97.8545	94.4135	89.5683	85.4501	90.7267	92.6015	98.0872	104.2816	107.0611	(72)
Total internal gains													
	331.0317	329.2189	318.8579	302.3001	285.8225	269.6550	258.9626	264.1746	272.5118	289.2552	308.4862	322.5880	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	1.6400	11.2829	0.3700	0.7900	0.7700	3.7482	(75)
Southeast	8.4000	36.7938	0.3700	0.8900	0.7700	70.5309	(77)
Southeast	3.8000	36.7938	0.5600	0.6800	0.7700	36.8968	(77)

Solar gains	111.1759	190.6188	264.1199	332.8004	377.8235	377.3168	362.8475	328.9180	287.8517	211.5660	133.3899	94.9967	(83)
Total gains	442.2076	519.8376	582.9778	635.1004	663.6460	646.9718	621.8101	593.0926	560.3635	500.8212	441.8761	417.5847	(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	113.2772	113.6108	113.9463	115.6540	116.0017	117.7721	117.7721	118.1327	117.0575	116.0017	115.3084	114.6233	
alpha	8.5518	8.5741	8.5964	8.7103	8.7334	8.8515	8.8515	8.8755	8.8038	8.7334	8.6872	8.6416	
util living area													
	0.9955	0.9823	0.9361	0.8023	0.6109	0.4270	0.3055	0.3338	0.5339	0.8503	0.9830	0.9970	(86)
MIT	20.5601	20.7014	20.8558	20.9680	20.9968	20.9999	21.0000	21.0000	20.9992	20.9572	20.7456	20.5317	(87)
Th 2	20.2276	20.2297	20.2318	20.2423	20.2444	20.2550	20.2550	20.2571	20.2508	20.2444	20.2402	20.2360	(88)
util rest of house													
	0.9937	0.9759	0.9167	0.7625	0.5627	0.3773	0.2538	0.2799	0.4764	0.8071	0.9757	0.9958	(89)
MIT 2	19.6538	19.8572	20.0685	20.2123	20.2421	20.2549	20.2550	20.2571	20.2503	20.2057	19.9307	19.6197	(90)
Living area fraction									fLA = Living area / (4) =			0.5102	(91)
MIT	20.1162	20.2879	20.4702	20.5978	20.6271	20.6350	20.6351	20.6361	20.6324	20.5891	20.3464	20.0850	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1162	20.2879	20.4702	20.5978	20.6271	20.6350	20.6351	20.6361	20.6324	20.5891	20.3464	20.0850	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9933	0.9764	0.9232	0.7817	0.5872	0.4027	0.2802	0.3074	0.5058	0.8277	0.9769	0.9955	(94)
Useful gains	439.2668	507.5836	538.2149	496.4344	389.7194	260.5176	174.2171	182.3366	283.4138	414.5282	431.6691	415.7236	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	709.9781	688.7252	623.4300	514.3150	391.3217	260.5672	174.2187	182.3402	283.7648	437.8717	584.1493	704.6937	(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													
	201.4092	121.7271	63.4001	12.8740	1.1921	0.0000	0.0000	0.0000	0.0000	17.3676	109.7858	214.9937	(98)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Space heating		742.7497 (98)
Space heating per m2	(98) / (4) =	13.7292 (99)

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.4600 (303a)
Fraction of heat from community Boilers	0.5400 (303b)
Fraction of total space heat from community Heat pump	0.4600 (304a)
Fraction of total space heat from community Boilers	0.5400 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	742.7497 (98)
Space heat from Heat pump = (98) x 0.46 x 1.00 x 1.05	358.7481 (307a)
Space heat from Boilers = (98) x 0.54 x 1.00 x 1.05	421.1391 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1822.7459 (64)
Water heat from Heat pump = (64) x 0.46 x 1.00 x 1.05	880.3863 (310a)
Water heat from Boilers = (64) x 0.54 x 1.00 x 1.05	1033.4969 (310b)
Electricity used for heat distribution	26.9377 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.2500, SFP = 0.6625)	
mechanical ventilation fans (SFP = 0.6625)	111.0649 (330a)
Total electricity for the above, kWh/year	111.0649 (331)
Electricity for lighting (calculated in Appendix L)	248.5446 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV Unit 0 (0.80 * 0.49 * 951 * 1.00) = -372.6415	-372.6415 (333)
Total delivered energy for all uses	2680.7383 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			370.0000	(367a)
Space heating from Heat pump	334.9012	0.5190	173.8137	(367)
Efficiency of heat source Boilers			93.9000	(367b)
Space heating from Boilers	1549.1331	0.2160	334.6128	(368)
Electrical energy for heat distribution	26.9377	0.5190	13.9807	(372)
Total CO2 associated with community systems			522.4071	(373)
(negative value allowed since DFEE <= TFEE)				
Space and water heating			522.4071	(376)
Pumps and fans	111.0649	0.5190	57.6427	(378)
Energy for lighting	248.5446	0.5190	128.9946	(379)
Energy saving/generation technologies				
PV Unit	-372.6415	0.5190	-193.4009	(380)
Total CO2, kg/year			515.6435	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			9.5300	(384)

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

DER		9.5300	ZC1
Total Floor Area	TFA	54.1000	
Assumed number of occupants	N	1.8109	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.2914	ZC2
CO2 emissions from cooking, equation (L16)		3.0030	ZC3
Total CO2 emissions		29.8244	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		29.8244	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	54.1000 (1b)	x	2.5400 (2b)	=	137.4140	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	54.1000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	137.4140	(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)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1455	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3955	(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) =	0.3065	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3908	0.3832	0.3755	0.3372	0.3295	0.2912	0.2912	0.2836	0.3065	0.3295	0.3449	0.3602	(22b)
Effective ac	0.5764	0.5734	0.5705	0.5569	0.5543	0.5424	0.5424	0.5402	0.5470	0.5543	0.5595	0.5649	(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 Semi-glazed door			2.1000	1.2000	2.5200			(26a)
TER Opening Type (Uw = 1.40)			11.4200	1.3258	15.1402			(27)
External Wall 1	31.5800	11.4200	20.1600	0.1800	3.6288			(29a)
Corridor wall	41.5500	2.1000	39.4500	0.1800	7.1010			(29a)
Total net area of external elements Aum(A, m2)			73.1300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.3900			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	2.4099	(36)
Total fabric heat loss (33) + (36) =	30.7999	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.1369	26.0024	25.8706	25.2514	25.1355	24.5962	24.5962	24.4963	24.8040	25.1355	25.3699	25.6149	(38)
Heat transfer coeff	56.9368	56.8023	56.6705	56.0512	55.9354	55.3961	55.3961	55.2962	55.6038	55.9354	56.1698	56.4148	(39)
Average = Sum(39)m / 12 =												56.0507	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0524	1.0500	1.0475	1.0361	1.0339	1.0240	1.0240	1.0221	1.0278	1.0339	1.0383	1.0428	(40)
HLP (average)												1.0361	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.8109 (42)
Average daily hot water use (litres/day)	77.2099 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	84.9309	81.8425	78.7541	75.6657	72.5773	69.4889	69.4889	72.5773	75.6657	78.7541	81.8425	84.9309	(44)
Energy conte	125.9501	110.1567	113.6719	99.1019	95.0906	82.0560	76.0369	87.2535	88.2956	102.9000	112.3234	121.9759	(45)
Energy content (annual)										Total = Sum(45)m =		1214.8124	(45)
Distribution loss (46)m = 0.15 x (45)m	18.8925	16.5235	17.0508	14.8653	14.2636	12.3084	11.4055	13.0880	13.2443	15.4350	16.8485	18.2964	(46)

Water storage loss:	
Store volume	2.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	0.2388 (48)
Temperature factor from Table 2b	0.5400 (49)
Enter (49) or (54) in (55)	0.1290 (55)
Total storage loss	

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

	3.9977	3.6109	3.9977	3.8688	3.9977	3.8688	3.9977	3.9977	3.8688	3.9977	3.8688	3.9977	(56)
If cylinder contains dedicated solar storage													
	3.9977	3.6109	3.9977	3.8688	3.9977	3.8688	3.9977	3.9977	3.8688	3.9977	3.8688	3.9977	(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													
	153.2102	134.7788	140.9320	125.4827	122.3508	108.4368	103.2971	114.5136	114.6764	130.1601	138.7042	149.2361	(62)
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													
	153.2102	134.7788	140.9320	125.4827	122.3508	108.4368	103.2971	114.5136	114.6764	130.1601	138.7042	149.2361	(64)
								Total per year (kWh/year) = Sum(64)m =				1535.7786	(64)
Heat gains from water heating, kWh/month													
	63.6865	56.3248	59.6040	54.0560	53.4257	48.3882	47.0904	50.8199	50.4629	56.0224	58.4521	62.3651	(65)

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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	90.5472	90.5472	90.5472	90.5472	90.5472	90.5472	90.5472	90.5472	90.5472	90.5472	90.5472	90.5472	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	14.1072	12.5299	10.1900	7.7145	5.7667	4.8685	5.2606	6.8379	9.1778	11.6533	13.6011	14.4993	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	157.8632	159.5014	155.3733	146.5853	135.4919	125.0657	118.1003	116.4622	120.5902	129.3783	140.4717	150.8979	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	32.0547	32.0547	32.0547	32.0547	32.0547	32.0547	32.0547	32.0547	32.0547	32.0547	32.0547	32.0547	(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)													
	-72.4377	-72.4377	-72.4377	-72.4377	-72.4377	-72.4377	-72.4377	-72.4377	-72.4377	-72.4377	-72.4377	-72.4377	(71)
Water heating gains (Table 5)													
	85.6001	83.8166	80.1129	75.0778	71.8088	67.2059	63.2935	68.3063	70.0874	75.2989	81.1835	83.8241	(72)
Total internal gains													
	310.7348	309.0121	298.8404	282.5417	266.2315	250.3042	239.8186	244.7706	253.0195	269.4946	288.4205	302.3854	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	1.3500	11.2829	0.6300	0.7000	0.7700	4.6551	(75)
Southeast	10.0700	36.7938	0.6300	0.7000	0.7700	113.2339	(77)

Solar gains	117.8890	202.3547	280.9776	355.0290	403.9455	403.7883	388.1448	351.2283	306.5565	224.7525	141.4854	100.7062	(83)
Total gains	428.6237	511.3668	579.8181	637.5707	670.1770	654.0925	627.9634	595.9989	559.5760	494.2471	429.9059	403.0916	(84)

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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	65.9845	66.1407	66.2946	67.0270	67.1658	67.8197	67.8197	67.9422	67.5663	67.1658	66.8855	66.5950	
alpha	5.3990	5.4094	5.4196	5.4685	5.4777	5.5213	5.5213	5.5295	5.5044	5.4777	5.4590	5.4397	
util living area													
	0.9925	0.9805	0.9502	0.8703	0.7224	0.5334	0.3869	0.4246	0.6561	0.9055	0.9823	0.9945	(86)
MIT	20.0714	20.2696	20.5210	20.7813	20.9361	20.9900	20.9986	20.9977	20.9707	20.7621	20.3648	20.0317	(87)
Th 2	20.0399	20.0419	20.0439	20.0534	20.0552	20.0634	20.0634	20.0649	20.0602	20.0552	20.0516	20.0478	(88)
util rest of house													
	0.9902	0.9748	0.9359	0.8370	0.6649	0.4592	0.3052	0.3395	0.5783	0.8728	0.9760	0.9927	(89)
MIT 2	18.8187	19.1054	19.4613	19.8157	19.9987	20.0574	20.0629	20.0641	20.0399	19.8018	19.2525	18.7671	(90)
Living area fraction									fLA = Living area / (4) =			0.5102	(91)
MIT	19.4578	19.6993	20.0019	20.3083	20.4769	20.5332	20.5403	20.5403	20.5147	20.2917	19.8200	19.4122	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4578	19.6993	20.0019	20.3083	20.4769	20.5332	20.5403	20.5403	20.5147	20.2917	19.8200	19.4122	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9884	0.9722	0.9352	0.8466	0.6915	0.4968	0.3469	0.3829	0.6169	0.8819	0.9741	0.9912	(94)
Useful gains	423.6362	497.1676	542.2503	539.7970	463.3996	324.9735	217.8579	228.2333	345.2285	435.8674	418.7919	399.5591	(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													
	863.0340	840.6336	765.1601	639.4520	490.9397	328.6744	218.2748	228.9453	356.6840	542.1100	714.4774	858.1954	(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													
	326.9120	230.8091	165.8449	71.7516	20.4898	0.0000	0.0000	0.0000	0.0000	79.0445	212.8935	341.2254	(98)
Space heating												1448.9708	(98)
Space heating per m2											(98) / (4) =	26.7832	(99)

8c. Space cooling requirement

Not applicable

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												1549.7014	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	326.9120	230.8091	165.8449	71.7516	20.4898	0.0000	0.0000	0.0000	0.0000	79.0445	212.8935	341.2254	(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)													
	349.6384	246.8547	177.3742	76.7397	21.9143	0.0000	0.0000	0.0000	0.0000	84.5395	227.6936	364.9469	(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													
	153.2102	134.7788	140.9320	125.4827	122.3508	108.4368	103.2971	114.5136	114.6764	130.1601	138.7042	149.2361	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.7866	86.2371	85.2488	83.3866	81.1767	79.8000	79.8000	79.8000	79.8000	83.5315	85.9534	86.9524	(217)
Fuel for water heating, kWh/month													
	176.5367	156.2886	165.3184	150.4831	150.7215	135.8857	129.4450	143.5008	143.7047	155.8216	161.3714	171.6295	(219)
Water heating fuel used												1840.7068	(219)
Annual totals kWh/year													
Space heating fuel - main system												1549.7014	(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)												249.1383	(232)
Total delivered energy for all uses												3714.5465	(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	1549.7014	0.2160	334.7355	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1840.7068	0.2160	397.5927	(264)
Space and water heating			732.3282	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	249.1383	0.5190	129.3028	(268)
Total CO2, kg/m2/year			900.5560	(272)
Emissions per m2 for space and water heating			13.5366	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.3901	(272b)
Emissions per m2 for pumps and fans			0.7195	(272c)
Target Carbon Dioxide Emission Rate (TER) = (13.5366 * 1.00) + 2.3901 + 0.7195, rounded to 2 d.p.			16.6500	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	A-2-06	**Issued on Date**	05/02/2020
Assessment Reference	ASHP-1-2	**Prop Type Ref**	2bed 3F
Property			

SAP Rating	87 B	**DER**	9.81	**TER**	14.84
Environmental	92 A	**% DER<TER**	33.91		
CO_2 Emissions (t/year)	0.71	**DFEE**	39.06	**TFEE**	42.75
General Requirements Compliance	Fail	**% DFEE<TFEE**	8.62		

Assessor Details	Miss Claudia Cioli, Claudia Cioli, Tel: 07481524839, clacioli@gmail.com	**Assessor ID**	R479-0001
Client			

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

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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England
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DWELLING AS DESIGNED

Mid-floor flat, total floor area 94 m²

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

1a TER and DER
Fuels for main heating:Mains gas (c), Electricity (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 14.84 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 9.81 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)42.7 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)39.1 kWh/m²/yrOK

---
2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.18 (max. 0.20)	0.18 (max. 0.35)	OK
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction

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

---
4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage Measured cylinder loss: 0.74 kWh/day
Permitted by DBSCG 0.32 Fail
Primary pipework insulated: No primary pipework

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

Hot water controls: No cylinderstat

---
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: 94%
Minimum: 70% OK

---
9 Summertime temperature
Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing South East: 7.61 m², No overhang
Windows facing South West: 12.20 m², No overhang
Air change rate: 0.50 ach
Blinds/curtains: None

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10 Key features
Party wall U-value 0.00 W/m²K
Air permeability 3.0 m³/m²h
Photovoltaic array 0.49 kW

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	93.5000 (1b)	x	2.5400 (2b)	=	237.4900	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.5000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	237.4900	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							0 * 10 =	0.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.0000	
Infiltration rate		0.1500	(18)
Number of sides sheltered		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

If mechanical ventilation:	0.5000	(23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	79.9000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2774	0.2739	0.2705	0.2531	0.2497	0.2323	0.2323	0.2288	0.2393	0.2497	0.2566	0.2635	(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	
W03 (Uw = 1.40)			8.4000	1.3258	11.1364			(27)
W02 (Uw = 1.40)			11.4100	1.3258	15.1269			(27)
door			2.1000	1.4000	2.9400			(26a)
External Wall 1	70.4000	19.8100	50.5900	0.1500	7.5885	140.0000	7082.6000	(29a)
Corridor wall	3.8100	2.1000	1.7100	0.1409	0.2410	110.0000	188.1000	(29a)
Exposed ceiling	23.9000		23.9000	0.1800	4.3020	9.0000	215.1000	(30)
Total net area of external elements Aum(A, m2)			98.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		41.3347			(33)
Party Wall 1			42.3000	0.0000	0.0000	140.0000	5922.0000	(32)
Party Floor			93.5000			80.0000	7480.0000	(32d)
Party Ceilings			69.6000			80.0000	5568.0000	(32b)
Internal Wall			79.7000			9.0000	717.3000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 27173.1000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	290.6214	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	16.8632	(36)
Total fabric heat loss	(33) + (36) = 58.1979	(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	21.7408	21.4689	21.1971	19.8378	19.5660	18.2067	18.2067	17.9349	18.7504	19.5660	20.1097	20.6534	(38)
Heat transfer coeff	79.9387	79.6669	79.3950	78.0358	77.7639	76.4046	76.4046	76.1328	76.9483	77.7639	78.3076	78.8513	(39)
Average = Sum(39)m / 12 =												77.9678	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8550	0.8521	0.8491	0.8346	0.8317	0.8172	0.8172	0.8143	0.8230	0.8317	0.8375	0.8433	(40)
HLP (average)												0.8339	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6707 (42)
Average daily hot water use (litres/day)	102.7665 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	113.0432	108.9325	104.8219	100.7112	96.6005	92.4899	92.4899	96.6005	100.7112	104.8219	108.9325	113.0432	(44)
Energy conte	167.6398	146.6188	151.2975	131.9048	126.5658	109.2167	101.2053	116.1346	117.5216	136.9601	149.5026	162.3502	(45)
Energy content (annual)										Total = Sum(45)m =		1616.9178	(45)
Distribution loss (46)m = 0.15 x (45)m													
	25.1460	21.9928	22.6946	19.7857	18.9849	16.3825	15.1808	17.4202	17.6282	20.5440	22.4254	24.3525	(46)
Water storage loss:													
Store volume												2.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.7400	(48)
Temperature factor from Table 2b												1.0000	(49)
Enter (49) or (54) in (55)												0.7400	(55)
Total storage loss													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(56)
If cylinder contains dedicated solar storage													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	213.8422	188.3500	197.4999	176.6168	172.7682	153.9287	147.4077	162.3370	162.2336	183.1625	194.2146	208.5526	(62)
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													
	213.8422	188.3500	197.4999	176.6168	172.7682	153.9287	147.4077	162.3370	162.2336	183.1625	194.2146	208.5526	(64)
								Total per year (kWh/year) = Sum(64)m =				2160.9138	(64)
Heat gains from water heating, kWh/month													
	92.7021	82.1357	87.2683	79.6280	79.0451	72.0841	70.6127	75.5767	74.8455	82.5011	85.4792	90.9434	(65)

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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	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	21.8751	19.4292	15.8009	11.9623	8.9420	7.5492	8.1572	10.6030	14.2313	18.0699	21.0902	22.4830	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	245.3715	247.9177	241.5014	227.8418	210.5991	194.3933	183.5669	181.0207	187.4370	201.0966	218.3393	234.5451	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.3533	36.3533	36.3533	36.3533	36.3533	36.3533	36.3533	36.3533	36.3533	36.3533	36.3533	36.3533	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	(71)
Water heating gains (Table 5)													
	124.5997	122.2258	117.2962	110.5944	106.2434	100.1169	94.9095	101.5815	103.9521	110.8886	118.7211	122.2357	(72)
Total internal gains													
	454.9062	452.6327	437.6584	413.4585	388.8443	365.1193	349.6935	356.2651	368.6804	393.1150	421.2107	442.3237	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	8.4000	36.7938	0.3700	0.8900	0.7700	70.5309	(79)
Southeast	7.6100	36.7938	0.5600	0.6800	0.7700	73.8907	(77)
Southwest	3.8000	36.7938	0.5600	0.6800	0.7700	36.8968	(79)

Solar gains	181.3184	308.8523	422.5852	523.6036	586.4796	582.2385	561.3401	514.4317	457.5704	341.3476	217.1777	155.1708	(83)
Total gains	636.2246	761.4850	860.2436	937.0620	975.3239	947.3578	911.0335	870.6968	826.2508	734.4626	638.3883	597.4945	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	94.4234	94.7456	95.0700	96.7260	97.0641	98.7909	98.7909	99.1437	98.0929	97.0641	96.3902	95.7255	
alpha	7.2949	7.3164	7.3380	7.4484	7.4709	7.5861	7.5861	7.6096	7.5395	7.4709	7.4260	7.3817	
util living area													
	0.9976	0.9909	0.9673	0.8850	0.7192	0.5145	0.3689	0.4020	0.6342	0.9198	0.9920	0.9985	(86)
MIT	20.3455	20.5062	20.7015	20.8922	20.9796	20.9985	20.9999	20.9998	20.9935	20.8751	20.5733	20.3181	(87)
Th 2	20.2060	20.2084	20.2109	20.2234	20.2259	20.2385	20.2385	20.2410	20.2335	20.2259	20.2209	20.2159	(88)
util rest of house													
	0.9968	0.9878	0.9566	0.8542	0.6671	0.4541	0.3051	0.3358	0.5676	0.8902	0.9887	0.9979	(89)
MIT 2	19.3335	19.5683	19.8469	20.1091	20.2090	20.2377	20.2385	20.2409	20.2293	20.0957	19.6769	19.3016	(90)
Living area fraction									fLA = Living area / (4) =			0.3412	(91)
MIT	19.6788	19.8883	20.1385	20.3763	20.4719	20.4972	20.4982	20.4998	20.4901	20.3616	19.9827	19.6484	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6788	19.8883	20.1385	20.3763	20.4719	20.4972	20.4982	20.4998	20.4901	20.3616	19.9827	19.6484	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9960	0.9862	0.9555	0.8607	0.6841	0.4747	0.3269	0.3584	0.5902	0.8960	0.9875	0.9973	(94)
Useful gains	633.7006	750.9716	821.9471	806.5502	667.2318	449.7343	297.8020	312.0508	487.6791	658.0583	630.3805	595.9060	(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													
	1229.3618	1194.0717	1082.8279	895.5615	682.1370	450.5773	297.8435	312.1323	491.7041	759.1003	1008.8158	1218.1267	(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													
	443.1719	297.7632	194.0953	64.0882	11.0894	0.0000	0.0000	0.0000	0.0000	75.1752	272.4735	462.9322	(98)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Space heating			1820.7890 (98)
Space heating per m2	(98) / (4) =		19.4737 (99)

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)			0.0000 (301)
Fraction of space heat from community system			1.0000 (302)
Fraction of heat from community Heat pump			0.4600 (303a)
Fraction of heat from community Boilers			0.5400 (303b)
Fraction of total space heat from community Heat pump			0.4600 (304a)
Fraction of total space heat from community Boilers			0.5400 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating			1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating			1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system			1.0500 (306)
Space heating:			
Annual space heating requirement			1820.7890 (98)
Space heat from Heat pump = (98) x 0.46 x 1.00 x 1.05			879.4411 (307a)
Space heat from Boilers = (98) x 0.54 x 1.00 x 1.05			1032.3874 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)			0.0000 (308)
Space heating fuel for secondary/supplementary system			0.0000 (309)
Water heating			
Annual water heating requirement			2160.9138 (64)
Water heat from Heat pump = (64) x 0.46 x 1.00 x 1.05			1043.7214 (310a)
Water heat from Boilers = (64) x 0.54 x 1.00 x 1.05			1225.2381 (310b)
Electricity used for heat distribution			41.8079 (313)
Annual totals kWh/year			
Electricity for pumps and fans:			
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.2500, SFP = 0.6625)			
mechanical ventilation fans (SFP = 0.6625)			191.9513 (330a)
Total electricity for the above, kWh/year			191.9513 (331)
Electricity for lighting (calculated in Appendix L)			386.3202 (332)
Energy saving/generation technologies (Appendices M ,N and Q)			
PV Unit 0 (0.80 * 0.49 * 951 * 1.00) =	-372.6415		-372.6415 (333)
Total delivered energy for all uses			4386.4180 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			370.0000	(367a)
Space heating from Heat pump	519.7736	0.5190	269.7625	(367)
Efficiency of heat source Boilers			93.9000	(367b)
Space heating from Boilers	2404.2870	0.2160	519.3260	(368)
Electrical energy for heat distribution	41.8079	0.5190	21.6983	(372)
Total CO2 associated with community systems			810.7868	(373)
(negative value allowed since DFEE <= TFEE)				
Space and water heating			810.7868	(376)
Pumps and fans	191.9513	0.5190	99.6227	(378)
Energy for lighting	386.3202	0.5190	200.5002	(379)
Energy saving/generation technologies				
PV Unit	-372.6415	0.5190	-193.4009	(380)
Total CO2, kg/year			917.5088	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			9.8100	(384)

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

DER		9.8100	ZC1
Total Floor Area	TFA	93.5000	
Assumed number of occupants	N	2.6707	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		15.5510	ZC2
CO2 emissions from cooking, equation (L16)		1.9582	ZC3
Total CO2 emissions		27.3193	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		27.3193	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	93.5000 (1b)	x	2.5400 (2b)	=	237.4900	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.5000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	237.4900	(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							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) =	0.1263	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3763	(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) =	0.3481	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4438	0.4351	0.4264	0.3829	0.3742	0.3307	0.3307	0.3220	0.3481	0.3742	0.3916	0.4090	(22b)
Effective ac	0.5985	0.5947	0.5909	0.5733	0.5700	0.5547	0.5547	0.5518	0.5606	0.5700	0.5767	0.5836	(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 Semi-glazed door			2.1000	1.2000	2.5200			(26a)
TER Opening Type (Uw = 1.40)			19.8100	1.3258	26.2633			(27)
External Wall 1	70.4000	19.8100	50.5900	0.1800	9.1062			(29a)
Corridor wall	3.8100	2.1000	1.7100	0.1800	0.3078			(29a)
Exposed ceiling	23.9000		23.9000	0.1300	3.1070			(30)
Total net area of external elements Aum(A, m2)			98.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		41.3043			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.5507	(36)
Total fabric heat loss					(33) + (36) =		55.8550	(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	46.9047	46.6049	46.3111	44.9312	44.6730	43.4711	43.4711	43.2485	43.9341	44.6730	45.1953	45.7413	(38)
Heat transfer coeff	102.7596	102.4599	102.1661	100.7861	100.5280	99.3261	99.3261	99.1035	99.7890	100.5280	101.0503	101.5963	(39)
Average = Sum(39)m / 12 =												100.7849	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0990	1.0958	1.0927	1.0779	1.0752	1.0623	1.0623	1.0599	1.0673	1.0752	1.0808	1.0866	(40)
HLP (average)												1.0779	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.6707 (42)
Average daily hot water use (litres/day)		97.6282 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	107.3910	103.4859	99.5808	95.6756	91.7705	87.8654	87.8654	91.7705	95.6756	99.5808	103.4859	107.3910	(44)
Energy conte	159.2578	139.2879	143.7326	125.3096	120.2375	103.7558	96.1450	110.3278	111.6455	130.1121	142.0275	154.2327	(45)
Energy content (annual)										Total = Sum(45)m =		1536.0719	(45)
Distribution loss (46)m = 0.15 x (45)m	23.8887	20.8932	21.5599	18.7964	18.0356	15.5634	14.4218	16.5492	16.7468	19.5168	21.3041	23.1349	(46)
Water storage loss:													
Store volume												2.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.2388	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.1290	(55)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss
3.9977 3.6109 3.9977 3.8688 3.9977 3.8688 3.9977 3.9977 3.8688 3.9977 3.8688 3.9977 (56)
If cylinder contains dedicated solar storage
3.9977 3.6109 3.9977 3.8688 3.9977 3.8688 3.9977 3.9977 3.8688 3.9977 3.8688 3.9977 (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
186.5179 163.9100 170.9928 151.6904 147.4977 130.1366 123.4052 137.5880 138.0263 157.3722 168.4083 181.4928 (62)
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
186.5179 163.9100 170.9928 151.6904 147.4977 130.1366 123.4052 137.5880 138.0263 157.3722 168.4083 181.4928 (64)
Total per year (kWh/year) = Sum(64)m = 1857.0381 (64)
Heat gains from water heating, kWh/month
74.7613 66.0109 69.5992 62.7701 61.7871 55.6034 53.7763 58.4921 58.2268 65.0704 68.3288 73.0905 (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	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
21.9221 19.4710 15.8349 11.9880 8.9612 7.5654 8.1747 10.6258 14.2619 18.1087 21.1356 22.5313 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
245.3715 247.9177 241.5014 227.8418 210.5991 194.3933 183.5669 181.0207 187.4370 201.0966 218.3393 234.5451 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
36.3533 36.3533 36.3533 36.3533 36.3533 36.3533 36.3533 36.3533 36.3533 36.3533 36.3533 36.3533 (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)
-106.8265 -106.8265 -106.8265 -106.8265 -106.8265 -106.8265 -106.8265 -106.8265 -106.8265 -106.8265 -106.8265 -106.8265 (71)
Water heating gains (Table 5)
100.4857 98.2305 93.5473 87.1806 83.0472 77.2270 72.2800 78.6184 80.8705 87.4602 94.9011 98.2399 (72)
Total internal gains
433.8392 431.6791 416.9435 393.0704 368.6674 345.2457 330.0815 336.3248 348.6293 372.7254 400.4359 421.3763 (73)

---
6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	7.6100	36.7938	0.6300	0.7000	0.7700	85.5720	(77)
Southwest	12.2000	36.7938	0.6300	0.7000	0.7700	137.1850	(79)

Solar gains	222.7570	379.4376	519.1630	643.2681	720.5139	715.3035	689.6289	632.0001	562.1437	419.3593	266.8115	190.6336	(83)
Total gains	656.5962	811.1167	936.1065	1036.3386	1089.1813	1060.5492	1019.7105	968.3250	910.7731	792.0848	667.2474	612.0098	(84)

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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	63.1868	63.3717	63.5539	64.4241	64.5896	65.3711	65.3711	65.5179	65.0678	64.5896	64.2557	63.9104	
alpha	5.2125	5.2248	5.2369	5.2949	5.3060	5.3581	5.3581	5.3679	5.3379	5.3060	5.2837	5.2607	
util living area	0.9959	0.9874	0.9647	0.9010	0.7709	0.5833	0.4260	0.4664	0.7061	0.9327	0.9896	0.9971	(86)
MIT	19.9231	20.1390	20.4130	20.7092	20.9030	20.9826	20.9973	20.9956	20.9536	20.6877	20.2429	19.8857	(87)
Th 2	20.0016	20.0042	20.0068	20.0189	20.0212	20.0317	20.0317	20.0337	20.0277	20.0212	20.0166	20.0118	(88)
util rest of house	0.9945	0.9834	0.9537	0.8721	0.7138	0.5019	0.3336	0.3707	0.6252	0.9062	0.9857	0.9961	(89)
MIT 2	18.5753	18.8900	19.2826	19.6957	19.9332	20.0210	20.0308	20.0320	19.9946	19.6792	19.0518	18.5282	(90)
Living area fraction									fLA = Living area / (4) =			0.3412	(91)
MIT	19.0351	19.3161	19.6683	20.0414	20.2641	20.3491	20.3605	20.3608	20.3218	20.0233	19.4582	18.9914	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0351	19.3161	19.6683	20.0414	20.2641	20.3491	20.3605	20.3608	20.3218	20.0233	19.4582	18.9914	(93)

---
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9927	0.9798	0.9492	0.8729	0.7289	0.5292	0.3652	0.4035	0.6509	0.9063	0.9827	0.9947	(94)
Useful gains	651.7952	794.7654	888.5331	904.5792	793.9135	561.2855	372.4262	390.6888	592.8344	717.8486	655.6950	608.7824	(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	1514.1781	1477.0764	1345.3491	1122.9037	860.9273	571.0316	373.5175	392.5274	620.8659	947.3010	1248.7950	1502.7473	(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	641.6129	458.5130	339.8711	157.1936	49.8582	0.0000	0.0000	0.0000	0.0000	170.7126	427.0320	665.1099	(98)

Space heating 2909.9033 (98)
Space heating per m2 (98) / (4) = 31.1220 (99)

8c. Space cooling requirement

Not applicable

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												3112.1961	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	641.6129	458.5130	339.8711	157.1936	49.8582	0.0000	0.0000	0.0000	0.0000	170.7126	427.0320	665.1099	(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)													
	686.2170	490.3882	363.4985	168.1215	53.3243	0.0000	0.0000	0.0000	0.0000	182.5804	456.7187	711.3475	(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													
	186.5179	163.9100	170.9928	151.6904	147.4977	130.1366	123.4052	137.5880	138.0263	157.3722	168.4083	181.4928	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.8470	87.4134	86.6128	84.9089	82.2569	79.8000	79.8000	79.8000	79.8000	85.0311	87.1933	87.9713	(217)
Fuel for water heating, kWh/month													
	212.3212	187.5112	197.4220	178.6507	179.3133	163.0785	154.6431	172.4160	172.9653	185.0761	193.1435	206.3092	(219)
Water heating fuel used												2202.8502	(219)
Annual totals kWh/year													
Space heating fuel - main system												3112.1961	(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)												387.1505	(232)
Total delivered energy for all uses												5777.1968	(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	3112.1961	0.2160	672.2343	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2202.8502	0.2160	475.8156	(264)
Space and water heating			1148.0500	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	387.1505	0.5190	200.9311	(268)
Total CO2, kg/m2/year			1387.9061	(272)
Emissions per m2 for space and water heating			12.2786	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.1490	(272b)
Emissions per m2 for pumps and fans			0.4163	(272c)
Target Carbon Dioxide Emission Rate (TER) = (12.2786 * 1.00) + 2.1490 + 0.4163, rounded to 2 d.p.			14.8400	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	A-3-01	**Issued on Date**	05/02/2020
Assessment Reference	ASHP-1-2	**Prop Type Ref**	2bed 3F
Property			

SAP Rating	85 B	**DER**	12.52	**TER**	18.55
Environmental	91 B	**% DER<TER**	32.52		
CO_2 Emissions (t/year)	0.68	**DFEE**	51.87	**TFEE**	55.41
General Requirements Compliance	Fail	**% DFEE<TFEE**	6.38		

Assessor Details	Miss Claudia Cioli, Claudia Cioli, Tel: 07481524839, clacioli@gmail.com	**Assessor ID**	R479-0001
Client			

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

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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England
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DWELLING AS DESIGNED

Mid-floor flat, total floor area 71 m²

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

1a TER and DER
Fuels for main heating:Mains gas (c), Electricity (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 18.55 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 12.52 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)55.4 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)51.9 kWh/m²/yrOK

---
2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.18 (max. 0.20)	0.18 (max. 0.35)	OK
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction

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

---
4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage Measured cylinder loss: 0.74 kWh/day
Permitted by DBSCG 0.32 Fail
Primary pipework insulated: No primary pipework

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

Hot water controls: No cylinderstat

---
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: 94%
Minimum: 70% OK

---
9 Summertime temperature
Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing North East: 1.92 m², No overhang
Windows facing North West: 16.01 m², No overhang
Air change rate: 0.50 ach
Blinds/curtains: None

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10 Key features
Party wall U-value 0.00 W/m²K
Air permeability 3.0 m³/m²h
Photovoltaic array 0.49 kW

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	71.2000 (1b)	x	2.4000 (2b)	=	170.8800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.2000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	170.8800	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							0 * 10 =	0.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.0000	
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	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) =	79.9000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2631	0.2599	0.2567	0.2408	0.2376	0.2216	0.2216	0.2184	0.2280	0.2376	0.2439	0.2503	(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	
W10 (Uw = 1.40)			1.9200	1.3258	2.5455			(27)
W03 (Uw = 1.40)			8.4000	1.3258	11.1364			(27)
W02 (Uw = 1.40)			7.6100	1.3258	10.0890			(27)
door			2.1000	1.4000	2.9400			(26a)
External Wall 1	53.7400	17.9300	35.8100	0.1500	5.3715	140.0000	5013.4000	(29a)
Corridor wall	7.8000	2.1000	5.7000	0.1409	0.8032	110.0000	627.0000	(29a)
Exposed ceiling	35.8000		35.8000	0.1800	6.4440	9.0000	322.2000	(30)
Total net area of external elements Aum(A, m2)			97.3400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		39.3295			(33)
Party Wall 1			39.3000	0.0000	0.0000	140.0000	5502.0000	(32)
Party Floor			71.2000			80.0000	5696.0000	(32d)
Party Ceilings			35.4000			80.0000	2832.0000	(32b)
Internal Wall			123.8000			9.0000	1114.2000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 21106.8000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	296.4438	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	15.4420	(36)
Total fabric heat loss	(33) + (36) = 54.7715	(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	14.8342	14.6545	14.4747	13.5760	13.3962	12.4975	12.4975	12.3178	12.8570	13.3962	13.7557	14.1152	(38)
Heat transfer coeff	69.6057	69.4260	69.2462	68.3475	68.1678	67.2690	67.2690	67.0893	67.6285	68.1678	68.5273	68.8867	(39)
Average = Sum(39)m / 12 =												68.3026	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9776	0.9751	0.9726	0.9599	0.9574	0.9448	0.9448	0.9423	0.9498	0.9574	0.9625	0.9675	(40)
HLP (average)												0.9593	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2749 (42)
Average daily hot water use (litres/day)	92.8725 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Daily hot water use													
	102.1598	98.4449	94.7300	91.0151	87.3002	83.5853	83.5853	87.3002	91.0151	94.7300	98.4449	102.1598	(44)
Energy conte	151.5000	132.5029	136.7311	119.2055	114.3805	98.7017	91.4616	104.9536	106.2070	123.7741	135.1091	146.7197	(45)
Energy content (annual)											Total = Sum(45)m =	1461.2468	(45)
Distribution loss (46)m = 0.15 x (45)m													
	22.7250	19.8754	20.5097	17.8808	17.1571	14.8053	13.7192	15.7430	15.9311	18.5661	20.2664	22.0080	(46)
Water storage loss:													
Store volume												2.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.7400	(48)
Temperature factor from Table 2b												1.0000	(49)
Enter (49) or (54) in (55)												0.7400	(55)
Total storage loss													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(56)
If cylinder contains dedicated solar storage													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(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													
	197.7024	174.2341	182.9335	163.9175	160.5829	143.4137	137.6640	151.1560	150.9190	169.9765	179.8211	192.9221	(62)
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													
	197.7024	174.2341	182.9335	163.9175	160.5829	143.4137	137.6640	151.1560	150.9190	169.9765	179.8211	192.9221	(64)
								Total per year (kWh/year) = Sum(64)m =				2005.2428	(64)
Heat gains from water heating, kWh/month													
	87.3357	77.4422	82.4250	75.4054	74.9934	68.5879	67.3729	71.8590	71.0834	78.1168	80.6934	85.7462	(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	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	17.8374	15.8430	12.8844	9.7543	7.2915	6.1558	6.6515	8.6459	11.6045	14.7346	17.1975	18.3332	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	200.0814	202.1576	196.9256	185.7873	171.7272	158.5126	149.6845	147.6083	152.8403	163.9786	178.0388	191.2533	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	(71)
Water heating gains (Table 5)													
	117.3867	115.2413	110.7863	104.7298	100.7976	95.2610	90.5550	96.5846	98.7270	104.9957	112.0741	115.2503	(72)
Total internal gains													
	392.4290	390.3655	377.7199	357.3949	336.9398	317.0529	304.0146	309.9624	320.2954	340.8325	364.4339	381.9603	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	1.9200	11.2829	0.3700	0.6500	0.7700	3.6105	(75)
Northwest	8.4000	11.2829	0.3700	0.8900	0.7700	21.6285	(81)
Northwest	7.6100	11.2829	0.5600	0.6800	0.7700	22.6588	(81)

Solar gains	47.8979	97.4975	175.6594	288.4833	387.7781	413.4125	386.7389	308.3128	214.0438	119.1496	60.2679	39.1158	(83)
Total gains	440.3269	487.8630	553.3793	645.8782	724.7180	730.4655	690.7535	618.2752	534.3391	459.9821	424.7018	421.0761	(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	84.2316	84.4497	84.6689	85.7822	86.0084	87.1575	87.1575	87.3910	86.6942	86.0084	85.5572	85.1107	
alpha	6.6154	6.6300	6.6446	6.7188	6.7339	6.8105	6.8105	6.8261	6.7796	6.7339	6.7038	6.6740	
util living area													
	0.9990	0.9977	0.9913	0.9511	0.8057	0.5827	0.4277	0.4970	0.8055	0.9802	0.9975	0.9993	(86)
MIT	20.1456	20.2535	20.4609	20.7478	20.9407	20.9942	20.9994	20.9984	20.9570	20.6938	20.3730	20.1276	(87)
Th 2	20.1020	20.1041	20.1063	20.1169	20.1190	20.1296	20.1296	20.1317	20.1253	20.1190	20.1147	20.1105	(88)
util rest of house													
	0.9986	0.9968	0.9878	0.9321	0.7509	0.5067	0.3436	0.4044	0.7298	0.9691	0.9964	0.9990	(89)
MIT 2	18.9586	19.1178	19.4206	19.8309	20.0674	20.1264	20.1294	20.1312	20.0948	19.7661	19.3009	18.9388	(90)
Living area fraction									fLA = Living area / (4) =			0.3581	(91)
MIT	19.3837	19.5245	19.7932	20.1593	20.3801	20.4372	20.4410	20.4418	20.4036	20.0983	19.6849	19.3646	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3837	19.5245	19.7932	20.1593	20.3801	20.4372	20.4410	20.4418	20.4036	20.0983	19.6849	19.3646	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9981	0.9960	0.9862	0.9332	0.7681	0.5339	0.3738	0.4377	0.7557	0.9688	0.9956	0.9986	(94)
Useful gains	439.5108	485.8899	545.7179	602.7303	556.6845	389.9908	258.1795	270.6102	403.7799	445.6392	422.8262	420.4912	(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													
	1049.9127	1015.3225	920.5031	769.5455	591.7047	392.6608	258.3792	271.1595	426.3039	647.4804	862.4095	1044.6388	(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													

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	454.1390	355.7787	278.8402	120.1070	26.0550	0.0000	0.0000	0.0000	0.0000	150.1699	316.5000	464.3658 (98)
Space heating												2165.9555 (98)
Space heating per m2											(98) / (4) =	30.4207 (99)

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)		0.0000 (301)
Fraction of space heat from community system		1.0000 (302)
Fraction of heat from community Heat pump		0.4600 (303a)
Fraction of heat from community Boilers		0.5400 (303b)
Fraction of total space heat from community Heat pump		0.4600 (304a)
Fraction of total space heat from community Boilers		0.5400 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating		1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating		1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system		1.0500 (306)
Space heating:		
Annual space heating requirement		2165.9555 (98)
Space heat from Heat pump = (98) x 0.46 x 1.00 x 1.05		1046.1565 (307a)
Space heat from Boilers = (98) x 0.54 x 1.00 x 1.05		1228.0968 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0.0000 (308)
Space heating fuel for secondary/supplementary system		0.0000 (309)
Water heating		
Annual water heating requirement		2005.2428 (64)
Water heat from Heat pump = (64) x 0.46 x 1.00 x 1.05		968.5323 (310a)
Water heat from Boilers = (64) x 0.54 x 1.00 x 1.05		1136.9727 (310b)
Electricity used for heat distribution		43.7976 (313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.2500, SFP = 0.6625)		
mechanical ventilation fans (SFP = 0.6625)		138.1138 (330a)
Total electricity for the above, kWh/year		138.1138 (331)
Electricity for lighting (calculated in Appendix L)		315.0141 (332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV Unit 0 (0.80 * 0.49 * 951 * 1.00) =	-372.6415	-372.6415 (333)
Total delivered energy for all uses		4460.2446 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			370.0000	(367a)
Space heating from Heat pump	544.5105	0.5190	282.6009	(367)
Efficiency of heat source Boilers			93.9000	(367b)
Space heating from Boilers	2518.7108	0.2160	544.0415	(368)
Electrical energy for heat distribution	43.7976	0.5190	22.7309	(372)
Total CO2 associated with community systems			849.3734	(373)
(negative value allowed since DFEE <= TFEE)				
Space and water heating			849.3734	(376)
Pumps and fans	138.1138	0.5190	71.6810	(378)
Energy for lighting	315.0141	0.5190	163.4923	(379)
Energy saving/generation technologies				
PV Unit	-372.6415	0.5190	-193.4009	(380)
Total CO2, kg/year			891.1459	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			12.5200	(384)

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

DER		12.5200	ZC1
Total Floor Area	TFA	71.2000	
Assumed number of occupants	N	2.2749	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.6523	ZC2
CO2 emissions from cooking, equation (L16)		2.4382	ZC3
Total CO2 emissions		31.6104	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		31.6104	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	71.2000 (1b)	x	2.4000 (2b)	=	170.8800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.2000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	170.8800	(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							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) =	0.1756	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.4256	(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) =	0.3617	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4612	0.4522	0.4431	0.3979	0.3889	0.3436	0.3436	0.3346	0.3617	0.3889	0.4069	0.4250	(22b)
Effective ac	0.6064	0.6022	0.5982	0.5792	0.5756	0.5590	0.5590	0.5560	0.5654	0.5756	0.5828	0.5903	(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 Semi-glazed door			2.1000	1.2000	2.5200			(26a)
TER Opening Type (Uw = 1.40)			15.7000	1.3258	20.8144			(27)
External Wall 1	53.7400	15.7000	38.0400	0.1800	6.8472			(29a)
Corridor wall	7.8000	2.1000	5.7000	0.1800	1.0260			(29a)
Exposed ceiling	35.8000		35.8000	0.1300	4.6540			(30)
Total net area of external elements Aum(A, m2)			97.3400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		35.8616			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.5745	(36)
Total fabric heat loss					(33) + (36) =		49.4361	(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	34.1925	33.9597	33.7314	32.6592	32.4586	31.5247	31.5247	31.3518	31.8845	32.4586	32.8644	33.2887	(38)
Heat transfer coeff	83.6286	83.3957	83.1675	82.0953	81.8947	80.9608	80.9608	80.7879	81.3205	81.8947	82.3005	82.7248	(39)
Average = Sum(39)m / 12 =												82.0943	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1746	1.1713	1.1681	1.1530	1.1502	1.1371	1.1371	1.1347	1.1421	1.1502	1.1559	1.1619	(40)
HLP (average)												1.1530	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.2749 (42)
Average daily hot water use (litres/day)		88.2289 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	97.0518	93.5227	89.9935	86.4643	82.9352	79.4060	79.4060	82.9352	86.4643	89.9935	93.5227	97.0518	(44)
Energy conte	143.9250	125.8778	129.8946	113.2452	108.6615	93.7666	86.8885	99.7059	100.8967	117.5854	128.3536	139.3837	(45)
Energy content (annual)										Total = Sum(45)m =		1388.1845	(45)
Distribution loss (46)m = 0.15 x (45)m	21.5888	18.8817	19.4842	16.9868	16.2992	14.0650	13.0333	14.9559	15.1345	17.6378	19.2530	20.9076	(46)
Water storage loss:													
Store volume												2.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.2388	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.1290	(55)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss
3.9977 3.6109 3.9977 3.8688 3.9977 3.8688 3.9977 3.9977 3.8688 3.9977 3.8688 3.9977 (56)
If cylinder contains dedicated solar storage
3.9977 3.6109 3.9977 3.8688 3.9977 3.8688 3.9977 3.9977 3.8688 3.9977 3.8688 3.9977 (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
171.1852 150.4998 157.1547 139.6260 135.9216 120.1474 114.1487 126.9660 127.2775 144.8455 154.7344 166.6439 (62)
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
171.1852 150.4998 157.1547 139.6260 135.9216 120.1474 114.1487 126.9660 127.2775 144.8455 154.7344 166.6439 (64)
Total per year (kWh/year) = Sum(64)m = 1709.1507 (64)
Heat gains from water heating, kWh/month
69.6632 61.5520 64.9981 58.7587 57.9381 52.2820 50.6986 54.9603 54.6528 60.9052 63.7822 68.1532 (65)

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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	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	17.8423	15.8474	12.8879	9.7570	7.2935	6.1575	6.6533	8.6483	11.6077	14.7386	17.2022	18.3382	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	200.0814	202.1576	196.9256	185.7873	171.7272	158.5126	149.6845	147.6083	152.8403	163.9786	178.0388	191.2533	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	(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)													
	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	(71)
Water heating gains (Table 5)													
	93.6333	91.5952	87.3630	81.6093	77.8737	72.6139	68.1432	73.8714	75.9066	81.8619	88.5864	91.6038	(72)
Total internal gains													
	371.6805	369.7238	357.3001	337.2771	317.0179	297.4076	284.6046	290.2515	300.4782	320.7027	343.9508	361.3188	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	1.6800	11.2829	0.6300	0.7000	0.7700	5.7930	(75)
Northwest	14.0200	11.2829	0.6300	0.7000	0.7700	48.3440	(81)

Solar gains	54.1370	110.1973	198.5405	326.0606	438.2894	467.2629	437.1149	348.4731	241.9248	134.6699	68.1183	44.2110	(83)
Total gains	425.8175	479.9211	555.8406	663.3377	755.3074	764.6705	721.7195	638.7246	542.4029	455.3726	412.0691	405.5297	(84)

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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	59.1238	59.2889	59.4517	60.2281	60.3756	61.0720	61.0720	61.2028	60.8019	60.3756	60.0779	59.7698	
alpha	4.9416	4.9526	4.9634	5.0152	5.0250	5.0715	5.0715	5.0802	5.0535	5.0250	5.0052	4.9847	
util living area													
	0.9980	0.9961	0.9883	0.9519	0.8375	0.6441	0.4865	0.5657	0.8486	0.9795	0.9961	0.9985	(86)
MIT	19.7241	19.8639	20.1368	20.5229	20.8298	20.9661	20.9933	20.9864	20.8668	20.4649	20.0335	19.7037	(87)
Th 2	19.9404	19.9430	19.9456	19.9578	19.9600	19.9707	19.9707	19.9726	19.9666	19.9600	19.9554	19.9506	(88)
util rest of house													
	0.9974	0.9947	0.9841	0.9342	0.7849	0.5542	0.3764	0.4475	0.7770	0.9690	0.9945	0.9980	(89)
MIT 2	18.2415	18.4474	18.8456	19.4015	19.7985	19.9492	19.9683	19.9672	19.8590	19.3317	18.7045	18.2190	(90)
Living area fraction									fLA = Living area / (4) =			0.3581	(91)
MIT	18.7725	18.9547	19.3081	19.8031	20.1679	20.3134	20.3354	20.3322	20.2199	19.7375	19.1805	18.7507	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7725	18.9547	19.3081	19.8031	20.1679	20.3134	20.3354	20.3322	20.2199	19.7375	19.1805	18.7507	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9963	0.9929	0.9807	0.9310	0.7965	0.5853	0.4161	0.4901	0.7969	0.9660	0.9928	0.9971	(94)
Useful gains	424.2329	476.5016	545.0880	617.5752	601.5932	447.5745	300.2753	313.0120	432.2517	439.9051	409.1169	404.3412	(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													
	1210.3168	1172.1049	1065.2150	895.0937	693.4728	462.5635	302.4191	317.6734	497.6762	748.3153	994.2308	1203.7058	(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													
	584.8464	467.4454	386.9745	199.8133	68.3585	0.0000	0.0000	0.0000	0.0000	229.4572	421.2820	594.7272	(98)
Space heating												2952.9046	(98)
Space heating per m2											(98) / (4) =	41.4734	(99)

8c. Space cooling requirement

Not applicable

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												93.5000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												3158.1868	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	584.8464	467.4454	386.9745	199.8133	68.3585	0.0000	0.0000	0.0000	0.0000	229.4572	421.2820	594.7272	(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)													
	625.5042	499.9416	413.8765	213.7041	73.1107	0.0000	0.0000	0.0000	0.0000	245.4088	450.5690	636.0719	(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													
	171.1852	150.4998	157.1547	139.6260	135.9216	120.1474	114.1487	126.9660	127.2775	144.8455	154.7344	166.6439	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.8333	87.6381	87.1259	85.7694	83.0873	79.8000	79.8000	79.8000	79.8000	86.0358	87.3536	87.9198	(217)
Fuel for water heating, kWh/month													
	194.8977	171.7288	180.3765	162.7924	163.5890	150.5606	143.0435	159.1053	159.4956	168.3549	177.1357	189.5408	(219)
Water heating fuel used												2020.6208	(219)
Annual totals kWh/year													
Space heating fuel - main system												3158.1868	(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)												315.1004	(232)
Total delivered energy for all uses												5568.9079	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3158.1868	0.2160	682.1683	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2020.6208	0.2160	436.4541	(264)
Space and water heating			1118.6224	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	315.1004	0.5190	163.5371	(268)
Total CO2, kg/m2/year			1321.0845	(272)
Emissions per m2 for space and water heating			15.7110	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.2969	(272b)
Emissions per m2 for pumps and fans			0.5467	(272c)
Target Carbon Dioxide Emission Rate (TER) = (15.7110 * 1.00) + 2.2969 + 0.5467, rounded to 2 d.p.			18.5500	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	A-3-02	**Issued on Date**	05/02/2020
Assessment Reference	ASHP-1-2	**Prop Type Ref**	2bed 3F
Property			

SAP Rating	85 B	**DER**	12.52	**TER**	18.55
Environmental	91 B	**% DER<TER**	32.52		
CO_2 Emissions (t/year)	0.68	**DFEE**	51.87	**TFEE**	55.41
General Requirements Compliance	Fail	**% DFEE<TFEE**	6.38		

Assessor Details	Miss Claudia Cioli, Claudia Cioli, Tel: 07481524839, clacioli@gmail.com	**Assessor ID**	R479-0001
Client			

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

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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England
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DWELLING AS DESIGNED

Mid-floor flat, total floor area 71 m²

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

1a TER and DER
Fuels for main heating:Mains gas (c), Electricity (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 18.55 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 12.52 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)55.4 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)51.9 kWh/m²/yrOK

---
2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.18 (max. 0.20)	0.18 (max. 0.35)	OK
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction

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

---
4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage Measured cylinder loss: 0.74 kWh/day
Permitted by DBSCG 0.32 Fail
Primary pipework insulated: No primary pipework

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

Hot water controls: No cylinderstat

---
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: 94%
Minimum: 70% OK

---
9 Summertime temperature
Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing North East: 1.92 m², No overhang
Windows facing North West: 16.01 m², No overhang
Air change rate: 0.50 ach
Blinds/curtains: None

---
10 Key features
Party wall U-value 0.00 W/m²K
Air permeability 3.0 m³/m²h
Photovoltaic array 0.49 kW

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	71.2000 (1b)	x	2.4000 (2b)	=	170.8800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.2000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	170.8800	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							0 * 10 =	0.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.0000	
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	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) =	79.9000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2631	0.2599	0.2567	0.2408	0.2376	0.2216	0.2216	0.2184	0.2280	0.2376	0.2439	0.2503	(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	
W10 (Uw = 1.40)			1.9200	1.3258	2.5455			(27)
W03 (Uw = 1.40)			8.4000	1.3258	11.1364			(27)
W02 (Uw = 1.40)			7.6100	1.3258	10.0890			(27)
door			2.1000	1.4000	2.9400			(26a)
External Wall 1	53.7400	17.9300	35.8100	0.1500	5.3715	140.0000	5013.4000	(29a)
Corridor wall	7.8000	2.1000	5.7000	0.1409	0.8032	110.0000	627.0000	(29a)
Exposed ceiling	35.8000		35.8000	0.1800	6.4440	9.0000	322.2000	(30)
Total net area of external elements Aum(A, m2)			97.3400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		39.3295			(33)
Party Wall 1			39.3000	0.0000	0.0000	140.0000	5502.0000	(32)
Party Floor			71.2000			80.0000	5696.0000	(32d)
Party Ceilings			35.4000			80.0000	2832.0000	(32b)
Internal Wall			123.8000			9.0000	1114.2000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 21106.8000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	296.4438	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	15.4420	(36)
Total fabric heat loss	(33) + (36) = 54.7715	(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	14.8342	14.6545	14.4747	13.5760	13.3962	12.4975	12.4975	12.3178	12.8570	13.3962	13.7557	14.1152	(38)
Heat transfer coeff	69.6057	69.4260	69.2462	68.3475	68.1678	67.2690	67.2690	67.0893	67.6285	68.1678	68.5273	68.8867	(39)
Average = Sum(39)m / 12 =												68.3026	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9776	0.9751	0.9726	0.9599	0.9574	0.9448	0.9448	0.9423	0.9498	0.9574	0.9625	0.9675	(40)
HLP (average)												0.9593	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2749 (42)
Average daily hot water use (litres/day)	92.8725 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Daily hot water use													
	102.1598	98.4449	94.7300	91.0151	87.3002	83.5853	83.5853	87.3002	91.0151	94.7300	98.4449	102.1598	(44)
Energy conte	151.5000	132.5029	136.7311	119.2055	114.3805	98.7017	91.4616	104.9536	106.2070	123.7741	135.1091	146.7197	(45)
Energy content (annual)										Total = Sum(45)m =		1461.2468	(45)
Distribution loss (46)m = 0.15 x (45)m													
	22.7250	19.8754	20.5097	17.8808	17.1571	14.8053	13.7192	15.7430	15.9311	18.5661	20.2664	22.0080	(46)
Water storage loss:													
Store volume												2.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.7400	(48)
Temperature factor from Table 2b												1.0000	(49)
Enter (49) or (54) in (55)												0.7400	(55)
Total storage loss													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(56)
If cylinder contains dedicated solar storage													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(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													
	197.7024	174.2341	182.9335	163.9175	160.5829	143.4137	137.6640	151.1560	150.9190	169.9765	179.8211	192.9221	(62)
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													
	197.7024	174.2341	182.9335	163.9175	160.5829	143.4137	137.6640	151.1560	150.9190	169.9765	179.8211	192.9221	(64)
								Total per year (kWh/year) = Sum(64)m =				2005.2428	(64)
Heat gains from water heating, kWh/month													
	87.3357	77.4422	82.4250	75.4054	74.9934	68.5879	67.3729	71.8590	71.0834	78.1168	80.6934	85.7462	(65)

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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	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	17.8374	15.8430	12.8844	9.7543	7.2915	6.1558	6.6515	8.6459	11.6045	14.7346	17.1975	18.3332	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	200.0814	202.1576	196.9256	185.7873	171.7272	158.5126	149.6845	147.6083	152.8403	163.9786	178.0388	191.2533	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	(71)
Water heating gains (Table 5)													
	117.3867	115.2413	110.7863	104.7298	100.7976	95.2610	90.5550	96.5846	98.7270	104.9957	112.0741	115.2503	(72)
Total internal gains													
	392.4290	390.3655	377.7199	357.3949	336.9398	317.0529	304.0146	309.9624	320.2954	340.8325	364.4339	381.9603	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	1.9200	11.2829	0.3700	0.6500	0.7700	3.6105	(75)
Northwest	8.4000	11.2829	0.3700	0.8900	0.7700	21.6285	(81)
Northwest	7.6100	11.2829	0.5600	0.6800	0.7700	22.6588	(81)

Solar gains	47.8979	97.4975	175.6594	288.4833	387.7781	413.4125	386.7389	308.3128	214.0438	119.1496	60.2679	39.1158	(83)
Total gains	440.3269	487.8630	553.3793	645.8782	724.7180	730.4655	690.7535	618.2752	534.3391	459.9821	424.7018	421.0761	(84)

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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	84.2316	84.4497	84.6689	85.7822	86.0084	87.1575	87.1575	87.3910	86.6942	86.0084	85.5572	85.1107	
alpha	6.6154	6.6300	6.6446	6.7188	6.7339	6.8105	6.8105	6.8261	6.7796	6.7339	6.7038	6.6740	
util living area													
	0.9990	0.9977	0.9913	0.9511	0.8057	0.5827	0.4277	0.4970	0.8055	0.9802	0.9975	0.9993	(86)
MIT	20.1456	20.2535	20.4609	20.7478	20.9407	20.9942	20.9994	20.9984	20.9570	20.6938	20.3730	20.1276	(87)
Th 2	20.1020	20.1041	20.1063	20.1169	20.1190	20.1296	20.1296	20.1317	20.1253	20.1190	20.1147	20.1105	(88)
util rest of house													
	0.9986	0.9968	0.9878	0.9321	0.7509	0.5067	0.3436	0.4044	0.7298	0.9691	0.9964	0.9990	(89)
MIT 2	18.9586	19.1178	19.4206	19.8309	20.0674	20.1264	20.1294	20.1312	20.0948	19.7661	19.3009	18.9388	(90)
Living area fraction										fLA = Living area / (4) =		0.3581	(91)
MIT	19.3837	19.5245	19.7932	20.1593	20.3801	20.4372	20.4410	20.4418	20.4036	20.0983	19.6849	19.3646	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3837	19.5245	19.7932	20.1593	20.3801	20.4372	20.4410	20.4418	20.4036	20.0983	19.6849	19.3646	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9981	0.9960	0.9862	0.9332	0.7681	0.5339	0.3738	0.4377	0.7557	0.9688	0.9956	0.9986	(94)
Useful gains	439.5108	485.8899	545.7179	602.7303	556.6845	389.9908	258.1795	270.6102	403.7799	445.6392	422.8262	420.4912	(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													
	1049.9127	1015.3225	920.5031	769.5455	591.7047	392.6608	258.3792	271.1595	426.3039	647.4804	862.4095	1044.6388	(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													

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	454.1390	355.7787	278.8402	120.1070	26.0550	0.0000	0.0000	0.0000	0.0000	150.1699	316.5000	464.3658 (98)
Space heating												2165.9555 (98)
Space heating per m2											(98) / (4) =	30.4207 (99)

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)		0.0000 (301)
Fraction of space heat from community system		1.0000 (302)
Fraction of heat from community Heat pump		0.4600 (303a)
Fraction of heat from community Boilers		0.5400 (303b)
Fraction of total space heat from community Heat pump		0.4600 (304a)
Fraction of total space heat from community Boilers		0.5400 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating		1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating		1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system		1.0500 (306)
Space heating:		
Annual space heating requirement		2165.9555 (98)
Space heat from Heat pump = (98) x 0.46 x 1.00 x 1.05		1046.1565 (307a)
Space heat from Boilers = (98) x 0.54 x 1.00 x 1.05		1228.0968 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0.0000 (308)
Space heating fuel for secondary/supplementary system		0.0000 (309)
Water heating		
Annual water heating requirement		2005.2428 (64)
Water heat from Heat pump = (64) x 0.46 x 1.00 x 1.05		968.5323 (310a)
Water heat from Boilers = (64) x 0.54 x 1.00 x 1.05		1136.9727 (310b)
Electricity used for heat distribution		43.7976 (313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.2500, SFP = 0.6625)		
mechanical ventilation fans (SFP = 0.6625)		138.1138 (330a)
Total electricity for the above, kWh/year		138.1138 (331)
Electricity for lighting (calculated in Appendix L)		315.0141 (332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV Unit 0 (0.80 * 0.49 * 951 * 1.00) =	-372.6415	-372.6415 (333)
Total delivered energy for all uses		4460.2446 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			370.0000	(367a)
Space heating from Heat pump	544.5105	0.5190	282.6009	(367)
Efficiency of heat source Boilers			93.9000	(367b)
Space heating from Boilers	2518.7108	0.2160	544.0415	(368)
Electrical energy for heat distribution	43.7976	0.5190	22.7309	(372)
Total CO2 associated with community systems			849.3734	(373)
(negative value allowed since DFEE <= TFEE)				
Space and water heating			849.3734	(376)
Pumps and fans	138.1138	0.5190	71.6810	(378)
Energy for lighting	315.0141	0.5190	163.4923	(379)
Energy saving/generation technologies				
PV Unit	-372.6415	0.5190	-193.4009	(380)
Total CO2, kg/year			891.1459	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			12.5200	(384)

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

DER		12.5200	ZC1
Total Floor Area	TFA	71.2000	
Assumed number of occupants	N	2.2749	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.6523	ZC2
CO2 emissions from cooking, equation (L16)		2.4382	ZC3
Total CO2 emissions		31.6104	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		31.6104	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	71.2000 (1b)	x	2.4000 (2b)	=	170.8800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.2000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	170.8800	(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							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) =	0.1756	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.4256	(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) =	0.3617	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4612	0.4522	0.4431	0.3979	0.3889	0.3436	0.3436	0.3346	0.3617	0.3889	0.4069	0.4250	(22b)
Effective ac	0.6064	0.6022	0.5982	0.5792	0.5756	0.5590	0.5590	0.5560	0.5654	0.5756	0.5828	0.5903	(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 Semi-glazed door			2.1000	1.2000	2.5200			(26a)
TER Opening Type (Uw = 1.40)			15.7000	1.3258	20.8144			(27)
External Wall 1	53.7400	15.7000	38.0400	0.1800	6.8472			(29a)
Corridor wall	7.8000	2.1000	5.7000	0.1800	1.0260			(29a)
Exposed ceiling	35.8000		35.8000	0.1300	4.6540			(30)
Total net area of external elements Aum(A, m2)			97.3400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		35.8616			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.5745	(36)
Total fabric heat loss					(33) + (36) =		49.4361	(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	34.1925	33.9597	33.7314	32.6592	32.4586	31.5247	31.5247	31.3518	31.8845	32.4586	32.8644	33.2887	(38)
Heat transfer coeff	83.6286	83.3957	83.1675	82.0953	81.8947	80.9608	80.9608	80.7879	81.3205	81.8947	82.3005	82.7248	(39)
Average = Sum(39)m / 12 =												82.0943	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1746	1.1713	1.1681	1.1530	1.1502	1.1371	1.1371	1.1347	1.1421	1.1502	1.1559	1.1619	(40)
HLP (average)												1.1530	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.2749 (42)
Average daily hot water use (litres/day)		88.2289 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	97.0518	93.5227	89.9935	86.4643	82.9352	79.4060	79.4060	82.9352	86.4643	89.9935	93.5227	97.0518	(44)
Energy conte	143.9250	125.8778	129.8946	113.2452	108.6615	93.7666	86.8885	99.7059	100.8967	117.5854	128.3536	139.3837	(45)
Energy content (annual)										Total = Sum(45)m =		1388.1845	(45)
Distribution loss (46)m = 0.15 x (45)m	21.5888	18.8817	19.4842	16.9868	16.2992	14.0650	13.0333	14.9559	15.1345	17.6378	19.2530	20.9076	(46)
Water storage loss:													
Store volume												2.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.2388	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.1290	(55)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss
3.9977 3.6109 3.9977 3.8688 3.9977 3.8688 3.9977 3.9977 3.8688 3.9977 3.8688 3.9977 (56)
If cylinder contains dedicated solar storage
3.9977 3.6109 3.9977 3.8688 3.9977 3.8688 3.9977 3.9977 3.8688 3.9977 3.8688 3.9977 (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
171.1852 150.4998 157.1547 139.6260 135.9216 120.1474 114.1487 126.9660 127.2775 144.8455 154.7344 166.6439 (62)
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
171.1852 150.4998 157.1547 139.6260 135.9216 120.1474 114.1487 126.9660 127.2775 144.8455 154.7344 166.6439 (64)
Total per year (kWh/year) = Sum(64)m = 1709.1507 (64)
Heat gains from water heating, kWh/month
69.6632 61.5520 64.9981 58.7587 57.9381 52.2820 50.6986 54.9603 54.6528 60.9052 63.7822 68.1532 (65)

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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	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	17.8423	15.8474	12.8879	9.7570	7.2935	6.1575	6.6533	8.6483	11.6077	14.7386	17.2022	18.3382	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	200.0814	202.1576	196.9256	185.7873	171.7272	158.5126	149.6845	147.6083	152.8403	163.9786	178.0388	191.2533	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	(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)													
	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	(71)
Water heating gains (Table 5)													
	93.6333	91.5952	87.3630	81.6093	77.8737	72.6139	68.1432	73.8714	75.9066	81.8619	88.5864	91.6038	(72)
Total internal gains													
	371.6805	369.7238	357.3001	337.2771	317.0179	297.4076	284.6046	290.2515	300.4782	320.7027	343.9508	361.3188	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	1.6800	11.2829	0.6300	0.7000	0.7700	5.7930	(75)
Northwest	14.0200	11.2829	0.6300	0.7000	0.7700	48.3440	(81)

Solar gains	54.1370	110.1973	198.5405	326.0606	438.2894	467.2629	437.1149	348.4731	241.9248	134.6699	68.1183	44.2110	(83)
Total gains	425.8175	479.9211	555.8406	663.3377	755.3074	764.6705	721.7195	638.7246	542.4029	455.3726	412.0691	405.5297	(84)

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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	59.1238	59.2889	59.4517	60.2281	60.3756	61.0720	61.0720	61.2028	60.8019	60.3756	60.0779	59.7698	
alpha	4.9416	4.9526	4.9634	5.0152	5.0250	5.0715	5.0715	5.0802	5.0535	5.0250	5.0052	4.9847	
util living area													
	0.9980	0.9961	0.9883	0.9519	0.8375	0.6441	0.4865	0.5657	0.8486	0.9795	0.9961	0.9985	(86)
MIT	19.7241	19.8639	20.1368	20.5229	20.8298	20.9661	20.9933	20.9864	20.8668	20.4649	20.0335	19.7037	(87)
Th 2	19.9404	19.9430	19.9456	19.9578	19.9600	19.9707	19.9707	19.9726	19.9666	19.9600	19.9554	19.9506	(88)
util rest of house													
	0.9974	0.9947	0.9841	0.9342	0.7849	0.5542	0.3764	0.4475	0.7770	0.9690	0.9945	0.9980	(89)
MIT 2	18.2415	18.4474	18.8456	19.4015	19.7985	19.9492	19.9683	19.9672	19.8590	19.3317	18.7045	18.2190	(90)
Living area fraction									fLA = Living area / (4) =			0.3581	(91)
MIT	18.7725	18.9547	19.3081	19.8031	20.1679	20.3134	20.3354	20.3322	20.2199	19.7375	19.1805	18.7507	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7725	18.9547	19.3081	19.8031	20.1679	20.3134	20.3354	20.3322	20.2199	19.7375	19.1805	18.7507	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9963	0.9929	0.9807	0.9310	0.7965	0.5853	0.4161	0.4901	0.7969	0.9660	0.9928	0.9971	(94)
Useful gains	424.2329	476.5016	545.0880	617.5752	601.5932	447.5745	300.2753	313.0120	432.2517	439.9051	409.1169	404.3412	(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													
	1210.3168	1172.1049	1065.2150	895.0937	693.4728	462.5635	302.4191	317.6734	497.6762	748.3153	994.2308	1203.7058	(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													
	584.8464	467.4454	386.9745	199.8133	68.3585	0.0000	0.0000	0.0000	0.0000	229.4572	421.2820	594.7272	(98)
Space heating												2952.9046	(98)
Space heating per m2											(98) / (4) =	41.4734	(99)

8c. Space cooling requirement

Not applicable

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												93.5000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												3158.1868	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	584.8464	467.4454	386.9745	199.8133	68.3585	0.0000	0.0000	0.0000	0.0000	229.4572	421.2820	594.7272	(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)													
	625.5042	499.9416	413.8765	213.7041	73.1107	0.0000	0.0000	0.0000	0.0000	245.4088	450.5690	636.0719	(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													
	171.1852	150.4998	157.1547	139.6260	135.9216	120.1474	114.1487	126.9660	127.2775	144.8455	154.7344	166.6439	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.8333	87.6381	87.1259	85.7694	83.0873	79.8000	79.8000	79.8000	79.8000	86.0358	87.3536	87.9198	(217)
Fuel for water heating, kWh/month													
	194.8977	171.7288	180.3765	162.7924	163.5890	150.5606	143.0435	159.1053	159.4956	168.3549	177.1357	189.5408	(219)
Water heating fuel used												2020.6208	(219)
Annual totals kWh/year													
Space heating fuel - main system												3158.1868	(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)												315.1004	(232)
Total delivered energy for all uses												5568.9079	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3158.1868	0.2160	682.1683	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2020.6208	0.2160	436.4541	(264)
Space and water heating			1118.6224	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	315.1004	0.5190	163.5371	(268)
Total CO2, kg/m2/year			1321.0845	(272)
Emissions per m2 for space and water heating			15.7110	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.2969	(272b)
Emissions per m2 for pumps and fans			0.5467	(272c)
Target Carbon Dioxide Emission Rate (TER) = (15.7110 * 1.00) + 2.2969 + 0.5467, rounded to 2 d.p.			18.5500	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	A-3-03	**Issued on Date**	08/01/2020
Assessment Reference	ASHP - be lean	**Prop Type Ref**	2bed 3F
Property			

SAP Rating	77 C	**DER**	28.24	**TER**	27.50
Environmental	81 B	**% DER<TER**	-2.69		
CO_2 Emissions (t/year)	1.34	**DFEE**	87.10	**TFEE**	97.13
General Requirements Compliance	Fail	**% DFEE<TFEE**	10.32		

Assessor Details	Miss Claudia Cioli, Claudia Cioli, Tel: 07481524839, clacioli@gmail.com	**Assessor ID**	R479-0001
Client			

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DWELLING AS DESIGNED

Mid-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 (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 27.50 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 28.24 kgCO□/m²Fail
Excess emissions =0.74 kgCO□/m² (2.7%)

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)97.1 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)87.1 kWh/m²/yrOK
---
2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.18 (max. 0.20)	0.18 (max. 0.35)	OK
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction
---
3 Air permeability
Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK
---
4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None
---
5 Cylinder insulation
Hot water storage Measured cylinder loss: 0.74 kWh/day
Permitted by DBSCG 0.32 Fail
Primary pipework insulated: No primary pipework
---
6 Controls
Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinderstat

---
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: 94%
Minimum: 70% OK
---
9 Summertime temperature
Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing West: 12.20 m², No overhang
Air change rate: 0.50 ach
Blinds/curtains: None
---
10 Key features
Party wall U-value 0.00 W/m²K
Thermal bridging y-value 0.033 W/m²K
Air permeability 3.0 m³/m²h

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	58.3000 (1b)	x	2.4000 (2b)	=	139.9200	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	58.3000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	139.9200	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							0 * 10 =	0.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.0000	
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1163	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation:	0.5000	(23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	79.9000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2487	0.2458	0.2429	0.2284	0.2255	0.2109	0.2109	0.2080	0.2168	0.2255	0.2313	0.2371	(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	
W03 (Uw = 1.40)			8.4000	1.3258	11.1364			(27)
W02 (Uw = 1.40)			3.8000	1.3258	5.0379			(27)
entrance door			2.1000	1.4000	2.9400			(26a)
External Wall 1	41.0000	12.2000	28.8000	0.1500	4.3200	140.0000	4032.0000	(29a)
Corridor Wall	277.0000	2.1000	274.9000	0.1500	41.2350	110.0000	30239.0000	(29a)
Exposed ceiling	6.7000		6.7000	0.1800	1.2060	9.0000	60.3000	(30)
Total net area of external elements Aum(A, m2)			324.7000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	65.8752			(33)
Party Wall 1			27.7000	0.0000	0.0000	140.0000	3878.0000	(32)
Party Floor			58.3000			80.0000	4664.0000	(32d)
Party Ceilings			51.6000			80.0000	4128.0000	(32b)
Internal Wall			74.0000			9.0000	666.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 47667.3000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	817.6209	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	10.5848	(36)
Total fabric heat loss	(33) + (36) = 76.4600	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	11.4842	11.3500	11.2159	10.5449	10.4107	9.7397	9.7397	9.6056	10.0081	10.4107	10.6791	10.9475	(38)
Heat transfer coeff	87.9443	87.8101	87.6759	87.0049	86.8707	86.1998	86.1998	86.0656	86.4682	86.8707	87.1391	87.4075	(39)
Average = Sum(39)m / 12 =												86.9714	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.5085	1.5062	1.5039	1.4924	1.4901	1.4786	1.4786	1.4763	1.4832	1.4901	1.4947	1.4993	(40)
HLP (average)												1.4918	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.9332 (42)
Average daily hot water use (litres/day)	84.3296 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	92.7625	89.3893	86.0162	82.6430	79.2698	75.8966	75.8966	79.2698	82.6430	86.0162	89.3893	92.7625	(44)
Energy conte	137.5642	120.3145	124.1538	108.2403	103.8591	89.6225	83.0484	95.2993	96.4375	112.3886	122.6809	133.2235	(45)
Energy content (annual)										Total = Sum(45)m =		1326.8325	(45)
Distribution loss (46)m = 0.15 x (45)m													
	20.6346	18.0472	18.6231	16.2360	15.5789	13.4434	12.4573	14.2949	14.4656	16.8583	18.4021	19.9835	(46)
Water storage loss:													
Store volume												2.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.7400	(48)
Temperature factor from Table 2b												1.0000	(49)
Enter (49) or (54) in (55)												0.7400	(55)
Total storage loss													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(56)
If cylinder contains dedicated solar storage													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(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													
	183.7666	162.0457	170.3562	152.9523	150.0615	134.3345	129.2508	141.5017	141.1495	158.5910	167.3929	179.4259	(62)
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													
	183.7666	162.0457	170.3562	152.9523	150.0615	134.3345	129.2508	141.5017	141.1495	158.5910	167.3929	179.4259	(64)
									Total per year (kWh/year) = Sum(64)m =			1870.8285	(64)
Heat gains from water heating, kWh/month													
	82.7020	73.3895	78.2430	71.7595	71.4951	65.5691	64.5755	68.6489	67.8351	74.3311	76.5610	81.2587	(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	96.6591	96.6591	96.6591	96.6591	96.6591	96.6591	96.6591	96.6591	96.6591	96.6591	96.6591	96.6591	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	15.0344	13.3534	10.8597	8.2215	6.1457	5.1884	5.6063	7.2873	9.7810	12.4192	14.4950	15.4522	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	168.6400	170.3900	165.9802	156.5922	144.7415	133.6035	126.1627	124.4127	128.8225	138.2105	150.0612	161.1992	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	32.6659	32.6659	32.6659	32.6659	32.6659	32.6659	32.6659	32.6659	32.6659	32.6659	32.6659	32.6659	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-77.3273	-77.3273	-77.3273	-77.3273	-77.3273	-77.3273	-77.3273	-77.3273	-77.3273	-77.3273	-77.3273	-77.3273	(71)
Water heating gains (Table 5)													
	111.1586	109.2106	105.1654	99.6660	96.0955	91.0682	86.7951	92.2701	94.2154	99.9074	106.3347	109.2187	(72)
Total internal gains													
	346.8308	344.9517	334.0030	316.4774	298.9804	281.8579	270.5618	275.9678	284.8166	302.5349	322.8887	337.8679	(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	8.4000	19.6403	0.3700	0.8900	0.7700	37.6488	(80)
West	3.8000	19.6403	0.3700	0.6800	0.7700	13.0129	(80)

Solar gains	50.6618	99.1051	163.2121	238.0351	291.7209	298.6282	284.3063	244.2149	189.8224	117.5966	63.1693	41.6618	(83)
Total gains	397.4925	444.0569	497.2151	554.5124	590.7013	580.4861	554.8680	520.1827	474.6390	420.1315	386.0580	379.5297	(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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	150.5603	150.7904	151.0212	152.1858	152.4209	153.6073	153.6073	153.8468	153.1305	152.4209	151.9514	151.4849	
alpha	11.0374	11.0527	11.0681	11.1457	11.1614	11.2405	11.2405	11.2565	11.2087	11.1614	11.1301	11.0990	
util living area													
	1.0000	1.0000	1.0000	0.9996	0.9917	0.8930	0.6805	0.7524	0.9832	0.9999	1.0000	1.0000	(86)
MIT	20.3967	20.4538	20.5639	20.7190	20.8747	20.9812	20.9991	20.9974	20.9267	20.7274	20.5348	20.3863	(87)
Th 2	19.6811	19.6829	19.6846	19.6932	19.6950	19.7036	19.7036	19.7054	19.7002	19.6950	19.6915	19.6880	(88)
util rest of house													
	1.0000	1.0000	0.9999	0.9988	0.9715	0.7495	0.4821	0.5466	0.9270	0.9996	1.0000	1.0000	(89)
MIT 2	18.8932	18.9783	19.1410	19.3752	19.5953	19.6996	19.7036	19.7052	19.6636	19.3893	19.1043	18.8839	(90)
Living area fraction									fLA = Living area / (4) =			0.4837	(91)
MIT	19.6204	19.6920	19.8293	20.0252	20.2142	20.3195	20.3302	20.3303	20.2746	20.0366	19.7963	19.6106	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6204	19.6920	19.8293	20.0252	20.2142	20.3195	20.3302	20.3303	20.2746	20.0366	19.7963	19.6106	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	1.0000	1.0000	1.0000	0.9991	0.9825	0.8257	0.5790	0.6485	0.9611	0.9997	1.0000	1.0000	(94)
Useful gains	397.4921	444.0548	497.1928	554.0356	580.3593	479.3155	321.2495	337.3259	456.1525	420.0136	386.0559	379.5295	(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													
	1347.3458	1298.8850	1168.6547	967.9444	739.6329	493.0203	321.5434	338.2620	533.9024	819.7606	1106.3429	1347.0062	(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													
	706.6911	574.4459	499.5677	298.0144	118.4995	0.0000	0.0000	0.0000	0.0000	297.4117	518.6066	719.8027	(98)
Space heating												3733.0396	(98)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Space heating per m2		(98) / (4) =	64.0316 (99)

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1000 (306)
Space heating:	
Annual space heating requirement	3733.0396 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.10	4106.3436 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1870.8285 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.10	2057.9114 (310a)
Electricity used for heat distribution	61.6425 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.2500, SFP = 0.6625)	
mechanical ventilation fans (SFP = 0.6625)	113.0903 (330a)
Total electricity for the above, kWh/year	113.0903 (331)
Electricity for lighting (calculated in Appendix L)	265.5119 (332)
Total delivered energy for all uses	6542.8572 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Boilers			93.9000	(367a)
Space heating from Boilers	6564.7018	0.2160	1417.9756	(367)
Electrical energy for heat distribution	61.6425	0.5190	31.9925	(372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			1449.9681	(373)
Space and water heating			1449.9681	(376)
Pumps and fans	113.0903	0.5190	58.6939	(378)
Energy for lighting	265.5119	0.5190	137.8007	(379)
Total CO2, kg/year			1646.4626	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			28.2400	(384)

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

DER		28.2400	ZC1
Total Floor Area	TFA	58.3000	
Assumed number of occupants	N	1.9332	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.1411	ZC2
CO2 emissions from cooking, equation (L16)		2.8370	ZC3
Total CO2 emissions		48.2181	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		48.2181	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	58.3000 (1b)	x	2.4000 (2b)	=	139.9200	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	58.3000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	139.9200	(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)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1429	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3929	(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) =	0.3045	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3883	0.3807	0.3730	0.3350	0.3274	0.2893	0.2893	0.2817	0.3045	0.3274	0.3426	0.3578	(22b)
Effective ac	0.5754	0.5725	0.5696	0.5561	0.5536	0.5418	0.5418	0.5397	0.5464	0.5536	0.5587	0.5640	(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 Semi-glazed door			2.1000	1.2000	2.5200			(26a)
TER Opening Type (Uw = 1.40)			12.2000	1.3258	16.1742			(27)
External Wall 1	41.0000	12.2000	28.8000	0.1800	5.1840			(29a)
Corridor Wall	277.0000	2.1000	274.9000	0.1800	49.4820			(29a)
Exposed ceiling	6.7000		6.7000	0.1300	0.8710			(30)
Total net area of external elements Aum(A, m2)			324.7000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		74.2312			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	9.3348	(36)
Total fabric heat loss (33) + (36) =	83.5660	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.5673	26.4321	26.2996	25.6774	25.5610	25.0191	25.0191	24.9187	25.2278	25.5610	25.7965	26.0427	(38)
Heat transfer coeff	110.1333	109.9982	109.8657	109.2435	109.1270	108.5851	108.5851	108.4847	108.7938	109.1270	109.3625	109.6088	(39)
Average = Sum(39)m / 12 =												109.2429	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.8891	1.8868	1.8845	1.8738	1.8718	1.8625	1.8625	1.8608	1.8661	1.8718	1.8759	1.8801	(40)
HLP (average)												1.8738	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.9332 (42)
Average daily hot water use (litres/day)	80.1131 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	88.1244	84.9199	81.7154	78.5108	75.3063	72.1018	72.1018	75.3063	78.5108	81.7154	84.9199	88.1244	(44)
Energy conte	130.6859	114.2988	117.9461	102.8283	98.6662	85.1414	78.8960	90.5343	91.6156	106.7691	116.5469	126.5624	(45)
Energy content (annual)										Total = Sum(45)m =		1260.4909	(45)
Distribution loss (46)m = 0.15 x (45)m	19.6029	17.1448	17.6919	15.4242	14.7999	12.7712	11.8344	13.5801	13.7423	16.0154	17.4820	18.9844	(46)

Water storage loss:	
Store volume	2.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	0.2388 (48)
Temperature factor from Table 2b	0.5400 (49)
Enter (49) or (54) in (55)	0.1290 (55)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss
3.9977 3.6109 3.9977 3.8688 3.9977 3.8688 3.9977 3.9977 3.8688 3.9977 3.8688 3.9977 (56)
If cylinder contains dedicated solar storage
3.9977 3.6109 3.9977 3.8688 3.9977 3.8688 3.9977 3.9977 3.8688 3.9977 3.8688 3.9977 (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
157.9461 138.9208 145.2062 129.2090 125.9263 111.5222 106.1562 117.7945 117.9964 134.0293 142.9277 153.8225 (62)
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
157.9461 138.9208 145.2062 129.2090 125.9263 111.5222 106.1562 117.7945 117.9964 134.0293 142.9277 153.8225 (64)
Total per year (kWh/year) = Sum(64)m = 1581.4571 (64)
Heat gains from water heating, kWh/month
65.2612 57.7020 61.0252 55.2950 54.6146 49.4141 48.0410 51.9108 51.5668 57.3089 59.8565 63.8901 (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	96.6591	96.6591	96.6591	96.6591	96.6591	96.6591	96.6591	96.6591	96.6591	96.6591	96.6591	96.6591	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
15.0794 13.3934 10.8922 8.2461 6.1641 5.2040 5.6231 7.3091 9.8102 12.4564 14.5384 15.4985 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
168.6400 170.3900 165.9802 156.5922 144.7415 133.6035 126.1627 124.4127 128.8225 138.2105 150.0612 161.1992 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
32.6659 32.6659 32.6659 32.6659 32.6659 32.6659 32.6659 32.6659 32.6659 32.6659 32.6659 32.6659 (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)
-77.3273 -77.3273 -77.3273 -77.3273 -77.3273 -77.3273 -77.3273 -77.3273 -77.3273 -77.3273 -77.3273 -77.3273 (71)
Water heating gains (Table 5)
87.7167 85.8661 82.0231 76.7986 73.4067 68.6308 64.5713 69.7726 71.6206 77.0280 83.1340 85.8738 (72)
Total internal gains
326.4338 324.6472 313.8933 296.6347 279.3100 262.4360 251.3548 256.4921 265.2511 282.6927 302.7314 317.5692 (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	12.2000	19.6403	0.6300	0.7000	0.7700	73.2283	(80)

Solar gains 73.2283 143.2501 235.9125 344.0643 421.6637 431.6479 410.9464 352.9969 274.3760 169.9783 91.3071 60.2194 (83)
Total gains 399.6622 467.8973 549.8058 640.6990 700.9738 694.0838 662.3011 609.4890 539.6271 452.6710 394.0384 377.7886 (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	36.7610	36.8062	36.8506	37.0604	37.1000	37.2851	37.2851	37.3196	37.2136	37.1000	37.0201	36.9369	
alpha	3.4507	3.4537	3.4567	3.4707	3.4733	3.4857	3.4857	3.4880	3.4809	3.4733	3.4680	3.4625	

util living area
0.9960 0.9926 0.9833 0.9566 0.8943 0.7775 0.6376 0.6941 0.8846 0.9749 0.9931 0.9967 (86)

MIT	18.9538	19.1443	19.5047	19.9909	20.4476	20.7786	20.9209	20.8916	20.6105	20.0125	19.3939	18.9172	(87)
Th 2	19.4083	19.4099	19.4115	19.4188	19.4202	19.4266	19.4266	19.4277	19.4241	19.4202	19.4174	19.4145	(88)

util rest of house
0.9945 0.9898 0.9765 0.9371 0.8418 0.6581 0.4458 0.5082 0.8035 0.9601 0.9900 0.9955 (89)

MIT 2	16.7747	17.0530	17.5768	18.2750	18.8939	19.2860	19.4022	19.3887	19.1201	18.3193	17.4232	16.7248	(90)

Living area fraction fLA = Living area / (4) = 0.4837 (91)

MIT	17.8287	18.0646	18.5093	19.1050	19.6454	20.0080	20.1368	20.1156	19.8410	19.1383	18.3764	17.7853	(92)

Temperature adjustment 0.0000
adjusted MIT 17.8287 18.0646 18.5093 19.1050 19.6454 20.0080 20.1368 20.1156 19.8410 19.1383 18.3764 17.7853 (93)

---
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9922	0.9862	0.9711	0.9321	0.8509	0.7082	0.5399	0.5986	0.8299	0.9564	0.9869	0.9935	(94)
Useful gains	396.5341	461.4562	533.9265	597.1897	596.4385	491.5489	357.6087	364.8372	447.8242	432.9254	388.8789	375.3416	(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
1489.9660 1448.0808 1319.4110 1114.8299 867.0583 587.2276 384.0469 403.0911 624.5879 931.7603 1233.2190 1489.0642 (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
813.5133 663.0117 584.4004 372.7009 201.3411 0.0000 0.0000 0.0000 0.0000 371.1332 607.9249 828.6096 (98)
Space heating 4442.6351 (98)
Space heating per m2 (98) / (4) = 76.2030 (99)

8c. Space cooling requirement

Not applicable

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												4751.4814	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	813.5133	663.0117	584.4004	372.7009	201.3411	0.0000	0.0000	0.0000	0.0000	371.1332	607.9249	828.6096	(98)
Space heating efficiency (main heating system 1)													
	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)													
	870.0677	709.1034	625.0272	398.6106	215.3381	0.0000	0.0000	0.0000	0.0000	396.9339	650.1870	886.2135	(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													
	157.9461	138.9208	145.2062	129.2090	125.9263	111.5222	106.1562	117.7945	117.9964	134.0293	142.9277	153.8225	(64)
Efficiency of water heater												79.8000	(216)
(217)m	88.5692	88.4456	88.1477	87.4803	86.0599	79.8000	79.8000	79.8000	79.8000	87.3910	88.2476	88.6391	(217)
Fuel for water heating, kWh/month													
	178.3308	157.0692	164.7305	147.7007	146.3241	139.7521	133.0278	147.6121	147.8651	153.3673	161.9621	173.5380	(219)
Water heating fuel used												1851.2799	(219)
Annual totals kWh/year													
Space heating fuel - main system												4751.4814	(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)												266.3071	(232)
Total delivered energy for all uses												6944.0683	(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	4751.4814	0.2160	1026.3200	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1851.2799	0.2160	399.8765	(264)
Space and water heating			1426.1964	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	266.3071	0.5190	138.2134	(268)
Total CO2, kg/m2/year			1603.3348	(272)
Emissions per m2 for space and water heating			24.4631	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.3707	(272b)
Emissions per m2 for pumps and fans			0.6677	(272c)
Target Carbon Dioxide Emission Rate (TER) = (24.4631 * 1.00) + 2.3707 + 0.6677, rounded to 2 d.p.			27.5000	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	A-3-03	**Issued on Date**	05/02/2020
Assessment Reference	ASHP 46%	**Prop Type Ref**	2bed 3F
Property			

SAP Rating	81 B	**DER**	19.63	**TER**	27.50
Environmental	87 B	**% DER<TER**	28.62		
CO_2 Emissions (t/year)	0.89	**DFEE**	87.10	**TFEE**	97.13
General Requirements Compliance	Fail	**% DFEE<TFEE**	10.32		

Assessor Details	Miss Claudia Cioli, Claudia Cioli, Tel: 07481524839, clacioli@gmail.com	**Assessor ID**	R479-0001
Client			

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

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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England
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DWELLING AS DESIGNED

Mid-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
Fuels for main heating:Mains gas (c), Electricity (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 27.50 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 19.63 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)97.1 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)87.1 kWh/m²/yrOK

---
2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.18 (max. 0.20)	0.18 (max. 0.35)	OK
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction

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

---
4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage Measured cylinder loss: 0.74 kWh/day
Permitted by DBSCG 0.32 Fail
Primary pipework insulated: No primary pipework

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

Hot water controls: No cylinderstat

---
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: 94%
Minimum: 70% OK

---
9 Summertime temperature
Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing West: 12.20 m², No overhang
Air change rate: 0.50 ach
Blinds/curtains: None

---
10 Key features
Party wall U-value 0.00 W/m²K
Thermal bridging y-value 0.033 W/m²K
Air permeability 3.0 m³/m²h
Photovoltaic array 0.49 kW

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	58.3000 (1b)	x	2.4000 (2b)	=	139.9200	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	58.3000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	139.9200	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							0 * 10 =	0.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.0000	
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1163	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation:	0.5000	(23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	79.9000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2487	0.2458	0.2429	0.2284	0.2255	0.2109	0.2109	0.2080	0.2168	0.2255	0.2313	0.2371	(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	
W03 (Uw = 1.40)			8.4000	1.3258	11.1364			(27)
W02 (Uw = 1.40)			3.8000	1.3258	5.0379			(27)
entrance door			2.1000	1.4000	2.9400			(26a)
External Wall 1	41.0000	12.2000	28.8000	0.1500	4.3200	140.0000	4032.0000	(29a)
Corridor Wall	277.0000	2.1000	274.9000	0.1500	41.2350	110.0000	30239.0000	(29a)
Exposed ceiling	6.7000		6.7000	0.1800	1.2060	9.0000	60.3000	(30)
Total net area of external elements Aum(A, m2)			324.7000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	65.8752			(33)
Party Wall 1			27.7000	0.0000	0.0000	140.0000	3878.0000	(32)
Party Floor			58.3000			80.0000	4664.0000	(32d)
Party Ceilings			51.6000			80.0000	4128.0000	(32b)
Internal Wall			74.0000			9.0000	666.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 47667.3000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	817.6209	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	10.5848	(36)
Total fabric heat loss	(33) + (36) = 76.4600	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	11.4842	11.3500	11.2159	10.5449	10.4107	9.7397	9.7397	9.6056	10.0081	10.4107	10.6791	10.9475	(38)
Heat transfer coeff	87.9443	87.8101	87.6759	87.0049	86.8707	86.1998	86.1998	86.0656	86.4682	86.8707	87.1391	87.4075	(39)
Average = Sum(39)m / 12 =												86.9714	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.5085	1.5062	1.5039	1.4924	1.4901	1.4786	1.4786	1.4763	1.4832	1.4901	1.4947	1.4993	(40)
HLP (average)												1.4918	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.9332 (42)
Average daily hot water use (litres/day)	84.3296 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	92.7625	89.3893	86.0162	82.6430	79.2698	75.8966	75.8966	79.2698	82.6430	86.0162	89.3893	92.7625	(44)
Energy conte	137.5642	120.3145	124.1538	108.2403	103.8591	89.6225	83.0484	95.2993	96.4375	112.3886	122.6809	133.2235	(45)
Energy content (annual)										Total = Sum(45)m =		1326.8325	(45)
Distribution loss (46)m = 0.15 x (45)m													
	20.6346	18.0472	18.6231	16.2360	15.5789	13.4434	12.4573	14.2949	14.4656	16.8583	18.4021	19.9835	(46)
Water storage loss:													
Store volume												2.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.7400	(48)
Temperature factor from Table 2b												1.0000	(49)
Enter (49) or (54) in (55)												0.7400	(55)
Total storage loss													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(56)
If cylinder contains dedicated solar storage													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(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													
	183.7666	162.0457	170.3562	152.9523	150.0615	134.3345	129.2508	141.5017	141.1495	158.5910	167.3929	179.4259	(62)
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													
	183.7666	162.0457	170.3562	152.9523	150.0615	134.3345	129.2508	141.5017	141.1495	158.5910	167.3929	179.4259	(64)
									Total per year (kWh/year) = Sum(64)m =			1870.8285	(64)
Heat gains from water heating, kWh/month													
	82.7020	73.3895	78.2430	71.7595	71.4951	65.5691	64.5755	68.6489	67.8351	74.3311	76.5610	81.2587	(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	96.6591	96.6591	96.6591	96.6591	96.6591	96.6591	96.6591	96.6591	96.6591	96.6591	96.6591	96.6591	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	15.0344	13.3534	10.8597	8.2215	6.1457	5.1884	5.6063	7.2873	9.7810	12.4192	14.4950	15.4522	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	168.6400	170.3900	165.9802	156.5922	144.7415	133.6035	126.1627	124.4127	128.8225	138.2105	150.0612	161.1992	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	32.6659	32.6659	32.6659	32.6659	32.6659	32.6659	32.6659	32.6659	32.6659	32.6659	32.6659	32.6659	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-77.3273	-77.3273	-77.3273	-77.3273	-77.3273	-77.3273	-77.3273	-77.3273	-77.3273	-77.3273	-77.3273	-77.3273	(71)
Water heating gains (Table 5)													
	111.1586	109.2106	105.1654	99.6660	96.0955	91.0682	86.7951	92.2701	94.2154	99.9074	106.3347	109.2187	(72)
Total internal gains													
	346.8308	344.9517	334.0030	316.4774	298.9804	281.8579	270.5618	275.9678	284.8166	302.5349	322.8887	337.8679	(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	8.4000	19.6403	0.3700	0.8900	0.7700	37.6488	(80)
West	3.8000	19.6403	0.3700	0.6800	0.7700	13.0129	(80)

Solar gains	50.6618	99.1051	163.2121	238.0351	291.7209	298.6282	284.3063	244.2149	189.8224	117.5966	63.1693	41.6618	(83)
Total gains	397.4925	444.0569	497.2151	554.5124	590.7013	580.4861	554.8680	520.1827	474.6390	420.1315	386.0580	379.5297	(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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	150.5603	150.7904	151.0212	152.1858	152.4209	153.6073	153.6073	153.8468	153.1305	152.4209	151.9514	151.4849	
alpha	11.0374	11.0527	11.0681	11.1457	11.1614	11.2405	11.2405	11.2565	11.2087	11.1614	11.1301	11.0990	
util living area													
	1.0000	1.0000	1.0000	0.9996	0.9917	0.8930	0.6805	0.7524	0.9832	0.9999	1.0000	1.0000	(86)
MIT	20.3967	20.4538	20.5639	20.7190	20.8747	20.9812	20.9991	20.9974	20.9267	20.7274	20.5348	20.3863	(87)
Th 2	19.6811	19.6829	19.6846	19.6932	19.6950	19.7036	19.7036	19.7054	19.7002	19.6950	19.6915	19.6880	(88)
util rest of house													
	1.0000	1.0000	0.9999	0.9988	0.9715	0.7495	0.4821	0.5466	0.9270	0.9996	1.0000	1.0000	(89)
MIT 2	18.8932	18.9783	19.1410	19.3752	19.5953	19.6996	19.7036	19.7052	19.6636	19.3893	19.1043	18.8839	(90)
Living area fraction									fLA = Living area / (4) =			0.4837	(91)
MIT	19.6204	19.6920	19.8293	20.0252	20.2142	20.3195	20.3302	20.3303	20.2746	20.0366	19.7963	19.6106	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6204	19.6920	19.8293	20.0252	20.2142	20.3195	20.3302	20.3303	20.2746	20.0366	19.7963	19.6106	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	1.0000	1.0000	1.0000	0.9991	0.9825	0.8257	0.5790	0.6485	0.9611	0.9997	1.0000	1.0000	(94)
Useful gains	397.4921	444.0548	497.1928	554.0356	580.3593	479.3155	321.2495	337.3259	456.1525	420.0136	386.0559	379.5295	(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													
	1347.3458	1298.8850	1168.6547	967.9444	739.6329	493.0203	321.5434	338.2620	533.9024	819.7606	1106.3429	1347.0062	(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													
	706.6911	574.4459	499.5677	298.0144	118.4995	0.0000	0.0000	0.0000	0.0000	297.4117	518.6066	719.8027	(98)
Space heating												3733.0396	(98)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Space heating per m2	(98) / (4) =	64.0316 (99)

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.4600 (303a)
Fraction of heat from community Boilers	0.5400 (303b)
Fraction of total space heat from community Heat pump	0.4600 (304a)
Fraction of total space heat from community Boilers	0.5400 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	3733.0396 (98)
Space heat from Heat pump = (98) x 0.46 x 1.00 x 1.05	1803.0581 (307a)
Space heat from Boilers = (98) x 0.54 x 1.00 x 1.05	2116.6335 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1870.8285 (64)
Water heat from Heat pump = (64) x 0.46 x 1.00 x 1.05	903.6102 (310a)
Water heat from Boilers = (64) x 0.54 x 1.00 x 1.05	1060.7598 (310b)
Electricity used for heat distribution	58.8406 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.2500, SFP = 0.6625)	
mechanical ventilation fans (SFP = 0.6625)	113.0903 (330a)
Total electricity for the above, kWh/year	113.0903 (331)
Electricity for lighting (calculated in Appendix L)	265.5119 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV Unit 0 (0.80 * 0.49 * 951 * 1.00) = -372.6415	-372.6415 (333)
Total delivered energy for all uses	5890.0223 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			370.0000	(367a)
Space heating from Heat pump	731.5320	0.5190	379.6651	(367)
Efficiency of heat source Boilers			93.9000	(367b)
Space heating from Boilers	3383.8054	0.2160	730.9020	(368)
Electrical energy for heat distribution	58.8406	0.5190	30.5383	(372)
Total CO2 associated with community systems			1141.1053	(373)
(negative value allowed since DFEE <= TFEE)				
Space and water heating			1141.1053	(376)
Pumps and fans	113.0903	0.5190	58.6939	(378)
Energy for lighting	265.5119	0.5190	137.8007	(379)
Energy saving/generation technologies				
PV Unit	-372.6415	0.5190	-193.4009	(380)
Total CO2, kg/year			1144.1990	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			19.6300	(384)

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

DER		19.6300	ZC1
Total Floor Area	TFA	58.3000	
Assumed number of occupants	N	1.9332	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.1411	ZC2
CO2 emissions from cooking, equation (L16)		2.8370	ZC3
Total CO2 emissions		39.6081	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		39.6081	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	58.3000 (1b)	x	2.4000 (2b)	=	139.9200	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	58.3000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	139.9200	(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)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1429	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3929	(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) =	0.3045	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3883	0.3807	0.3730	0.3350	0.3274	0.2893	0.2893	0.2817	0.3045	0.3274	0.3426	0.3578	(22b)
Effective ac	0.5754	0.5725	0.5696	0.5561	0.5536	0.5418	0.5418	0.5397	0.5464	0.5536	0.5587	0.5640	(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 Semi-glazed door			2.1000	1.2000	2.5200			(26a)
TER Opening Type (Uw = 1.40)			12.2000	1.3258	16.1742			(27)
External Wall 1	41.0000	12.2000	28.8000	0.1800	5.1840			(29a)
Corridor Wall	277.0000	2.1000	274.9000	0.1800	49.4820			(29a)
Exposed ceiling	6.7000		6.7000	0.1300	0.8710			(30)
Total net area of external elements Aum(A, m2)			324.7000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		74.2312			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	9.3348	(36)
Total fabric heat loss (33) + (36) =	83.5660	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.5673	26.4321	26.2996	25.6774	25.5610	25.0191	25.0191	24.9187	25.2278	25.5610	25.7965	26.0427	(38)
Heat transfer coeff	110.1333	109.9982	109.8657	109.2435	109.1270	108.5851	108.5851	108.4847	108.7938	109.1270	109.3625	109.6088	(39)
Average = Sum(39)m / 12 =												109.2429	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.8891	1.8868	1.8845	1.8738	1.8718	1.8625	1.8625	1.8608	1.8661	1.8718	1.8759	1.8801	(40)
HLP (average)												1.8738	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.9332 (42)
Average daily hot water use (litres/day)	80.1131 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	88.1244	84.9199	81.7154	78.5108	75.3063	72.1018	72.1018	75.3063	78.5108	81.7154	84.9199	88.1244	(44)
Energy conte	130.6859	114.2988	117.9461	102.8283	98.6662	85.1414	78.8960	90.5343	91.6156	106.7691	116.5469	126.5624	(45)
Energy content (annual)										Total = Sum(45)m =		1260.4909	(45)
Distribution loss (46)m = 0.15 x (45)m	19.6029	17.1448	17.6919	15.4242	14.7999	12.7712	11.8344	13.5801	13.7423	16.0154	17.4820	18.9844	(46)

Water storage loss:	
Store volume	2.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	0.2388 (48)
Temperature factor from Table 2b	0.5400 (49)
Enter (49) or (54) in (55)	0.1290 (55)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss
3.9977 3.6109 3.9977 3.8688 3.9977 3.8688 3.9977 3.9977 3.8688 3.9977 3.8688 3.9977 (56)
If cylinder contains dedicated solar storage
3.9977 3.6109 3.9977 3.8688 3.9977 3.8688 3.9977 3.9977 3.8688 3.9977 3.8688 3.9977 (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
157.9461 138.9208 145.2062 129.2090 125.9263 111.5222 106.1562 117.7945 117.9964 134.0293 142.9277 153.8225 (62)
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
157.9461 138.9208 145.2062 129.2090 125.9263 111.5222 106.1562 117.7945 117.9964 134.0293 142.9277 153.8225 (64)
Total per year (kWh/year) = Sum(64)m = 1581.4571 (64)
Heat gains from water heating, kWh/month
65.2612 57.7020 61.0252 55.2950 54.6146 49.4141 48.0410 51.9108 51.5668 57.3089 59.8565 63.8901 (65)

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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	96.6591	96.6591	96.6591	96.6591	96.6591	96.6591	96.6591	96.6591	96.6591	96.6591	96.6591	96.6591	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
15.0794 13.3934 10.8922 8.2461 6.1641 5.2040 5.6231 7.3091 9.8102 12.4564 14.5384 15.4985 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
168.6400 170.3900 165.9802 156.5922 144.7415 133.6035 126.1627 124.4127 128.8225 138.2105 150.0612 161.1992 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
32.6659 32.6659 32.6659 32.6659 32.6659 32.6659 32.6659 32.6659 32.6659 32.6659 32.6659 32.6659 (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)
-77.3273 -77.3273 -77.3273 -77.3273 -77.3273 -77.3273 -77.3273 -77.3273 -77.3273 -77.3273 -77.3273 -77.3273 (71)
Water heating gains (Table 5)
87.7167 85.8661 82.0231 76.7986 73.4067 68.6308 64.5713 69.7726 71.6206 77.0280 83.1340 85.8738 (72)
Total internal gains
326.4338 324.6472 313.8933 296.6347 279.3100 262.4360 251.3548 256.4921 265.2511 282.6927 302.7314 317.5692 (73)

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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	12.2000	19.6403	0.6300	0.7000	0.7700	73.2283	(80)

Solar gains 73.2283 143.2501 235.9125 344.0643 421.6637 431.6479 410.9464 352.9969 274.3760 169.9783 91.3071 60.2194 (83)
Total gains 399.6622 467.8973 549.8058 640.6990 700.9738 694.0838 662.3011 609.4890 539.6271 452.6710 394.0384 377.7886 (84)

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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	36.7610	36.8062	36.8506	37.0604	37.1000	37.2851	37.2851	37.3196	37.2136	37.1000	37.0201	36.9369	
alpha	3.4507	3.4537	3.4567	3.4707	3.4733	3.4857	3.4857	3.4880	3.4809	3.4733	3.4680	3.4625	

util living area
0.9960 0.9926 0.9833 0.9566 0.8943 0.7775 0.6376 0.6941 0.8846 0.9749 0.9931 0.9967 (86)

MIT	18.9538	19.1443	19.5047	19.9909	20.4476	20.7786	20.9209	20.8916	20.6105	20.0125	19.3939	18.9172	(87)
Th 2	19.4083	19.4099	19.4115	19.4188	19.4202	19.4266	19.4266	19.4277	19.4241	19.4202	19.4174	19.4145	(88)

util rest of house
0.9945 0.9898 0.9765 0.9371 0.8418 0.6581 0.4458 0.5082 0.8035 0.9601 0.9900 0.9955 (89)

MIT 2	16.7747	17.0530	17.5768	18.2750	18.8939	19.2860	19.4022	19.3887	19.1201	18.3193	17.4232	16.7248	(90)

Living area fraction fLA = Living area / (4) = 0.4837 (91)

MIT	17.8287	18.0646	18.5093	19.1050	19.6454	20.0080	20.1368	20.1156	19.8410	19.1383	18.3764	17.7853	(92)

Temperature adjustment 0.0000
adjusted MIT 17.8287 18.0646 18.5093 19.1050 19.6454 20.0080 20.1368 20.1156 19.8410 19.1383 18.3764 17.7853 (93)

---
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9922	0.9862	0.9711	0.9321	0.8509	0.7082	0.5399	0.5986	0.8299	0.9564	0.9869	0.9935	(94)
Useful gains	396.5341	461.4562	533.9265	597.1897	596.4385	491.5489	357.6087	364.8372	447.8242	432.9254	388.8789	375.3416	(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
1489.9660 1448.0808 1319.4110 1114.8299 867.0583 587.2276 384.0469 403.0911 624.5879 931.7603 1233.2190 1489.0642 (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
813.5133 663.0117 584.4004 372.7009 201.3411 0.0000 0.0000 0.0000 0.0000 371.1332 607.9249 828.6096 (98)
Space heating 4442.6351 (98)
Space heating per m2 (98) / (4) = 76.2030 (99)

8c. Space cooling requirement

Not applicable

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												4751.4814	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	813.5133	663.0117	584.4004	372.7009	201.3411	0.0000	0.0000	0.0000	0.0000	371.1332	607.9249	828.6096	(98)
Space heating efficiency (main heating system 1)													
	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)													
	870.0677	709.1034	625.0272	398.6106	215.3381	0.0000	0.0000	0.0000	0.0000	396.9339	650.1870	886.2135	(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													
	157.9461	138.9208	145.2062	129.2090	125.9263	111.5222	106.1562	117.7945	117.9964	134.0293	142.9277	153.8225	(64)
Efficiency of water heater												79.8000	(216)
(217)m	88.5692	88.4456	88.1477	87.4803	86.0599	79.8000	79.8000	79.8000	79.8000	87.3910	88.2476	88.6391	(217)
Fuel for water heating, kWh/month													
	178.3308	157.0692	164.7305	147.7007	146.3241	139.7521	133.0278	147.6121	147.8651	153.3673	161.9621	173.5380	(219)
Water heating fuel used												1851.2799	(219)
Annual totals kWh/year													
Space heating fuel - main system												4751.4814	(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)												266.3071	(232)
Total delivered energy for all uses												6944.0683	(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	4751.4814	0.2160	1026.3200	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1851.2799	0.2160	399.8765	(264)
Space and water heating			1426.1964	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	266.3071	0.5190	138.2134	(268)
Total CO2, kg/m2/year			1603.3348	(272)
Emissions per m2 for space and water heating			24.4631	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.3707	(272b)
Emissions per m2 for pumps and fans			0.6677	(272c)
Target Carbon Dioxide Emission Rate (TER) = (24.4631 * 1.00) + 2.3707 + 0.6677, rounded to 2 d.p.			27.5000	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	A-3-03	**Issued on Date**	14/01/2020
Assessment Reference	ASHP 50%	**Prop Type Ref**	2bed 3F
Property			

SAP Rating	80 C	**DER**	20.79	**TER**	27.50
Environmental	86 B	**% DER<TER**	24.40		
CO_2 Emissions (t/year)	0.94	**DFEE**	87.10	**TFEE**	97.13
General Requirements Compliance	Fail	**% DFEE<TFEE**	10.32		

Assessor Details	Miss Claudia Cioli, Claudia Cioli, Tel: 07481524839, clacioli@gmail.com	**Assessor ID**	R479-0001
Client			

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

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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England
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DWELLING AS DESIGNED

Mid-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
Fuels for main heating:Mains gas (c), Electricity (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 27.50 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 20.79 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)97.1 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)87.1 kWh/m²/yrOK

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2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.18 (max. 0.20)	0.18 (max. 0.35)	OK
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction

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

---
4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage Measured cylinder loss: 0.74 kWh/day
Permitted by DBSCG 0.32 Fail
Primary pipework insulated: No primary pipework

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

Hot water controls: No cylinderstat

---
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: 94%
Minimum: 70% OK

---
9 Summertime temperature
Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing West: 12.20 m², No overhang
Air change rate: 0.50 ach
Blinds/curtains: None

---
10 Key features
Party wall U-value 0.00 W/m²K
Thermal bridging y-value 0.033 W/m²K
Air permeability 3.0 m³/m²h
Photovoltaic array 0.49 kW

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	58.3000 (1b)	x	2.4000 (2b)	=	139.9200	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	58.3000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	139.9200	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							0 * 10 =	0.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.0000	
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1163	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation:	0.5000	(23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	79.9000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2487	0.2458	0.2429	0.2284	0.2255	0.2109	0.2109	0.2080	0.2168	0.2255	0.2313	0.2371	(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	
W03 (Uw = 1.40)			8.4000	1.3258	11.1364			(27)
W02 (Uw = 1.40)			3.8000	1.3258	5.0379			(27)
entrance door			2.1000	1.4000	2.9400			(26a)
External Wall 1	41.0000	12.2000	28.8000	0.1500	4.3200	140.0000	4032.0000	(29a)
Corridor Wall	277.0000	2.1000	274.9000	0.1500	41.2350	110.0000	30239.0000	(29a)
Exposed ceiling	6.7000		6.7000	0.1800	1.2060	9.0000	60.3000	(30)
Total net area of external elements Aum(A, m2)			324.7000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	65.8752			(33)
Party Wall 1			27.7000	0.0000	0.0000	140.0000	3878.0000	(32)
Party Floor			58.3000			80.0000	4664.0000	(32d)
Party Ceilings			51.6000			80.0000	4128.0000	(32b)
Internal Wall			74.0000			9.0000	666.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 47667.3000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	817.6209	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	10.5848	(36)
Total fabric heat loss	(33) + (36) = 76.4600	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	11.4842	11.3500	11.2159	10.5449	10.4107	9.7397	9.7397	9.6056	10.0081	10.4107	10.6791	10.9475	(38)
Heat transfer coeff	87.9443	87.8101	87.6759	87.0049	86.8707	86.1998	86.1998	86.0656	86.4682	86.8707	87.1391	87.4075	(39)
Average = Sum(39)m / 12 =												86.9714	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.5085	1.5062	1.5039	1.4924	1.4901	1.4786	1.4786	1.4763	1.4832	1.4901	1.4947	1.4993	(40)
HLP (average)												1.4918	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.9332 (42)
Average daily hot water use (litres/day)	84.3296 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	92.7625	89.3893	86.0162	82.6430	79.2698	75.8966	75.8966	79.2698	82.6430	86.0162	89.3893	92.7625	(44)
Energy conte	137.5642	120.3145	124.1538	108.2403	103.8591	89.6225	83.0484	95.2993	96.4375	112.3886	122.6809	133.2235	(45)
Energy content (annual)										Total = Sum(45)m =		1326.8325	(45)
Distribution loss (46)m = 0.15 x (45)m													
	20.6346	18.0472	18.6231	16.2360	15.5789	13.4434	12.4573	14.2949	14.4656	16.8583	18.4021	19.9835	(46)
Water storage loss:													
Store volume												2.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.7400	(48)
Temperature factor from Table 2b												1.0000	(49)
Enter (49) or (54) in (55)												0.7400	(55)
Total storage loss													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(56)
If cylinder contains dedicated solar storage													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(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													
	183.7666	162.0457	170.3562	152.9523	150.0615	134.3345	129.2508	141.5017	141.1495	158.5910	167.3929	179.4259	(62)
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													
	183.7666	162.0457	170.3562	152.9523	150.0615	134.3345	129.2508	141.5017	141.1495	158.5910	167.3929	179.4259	(64)
									Total per year (kWh/year) = Sum(64)m =			1870.8285	(64)
Heat gains from water heating, kWh/month													
	82.7020	73.3895	78.2430	71.7595	71.4951	65.5691	64.5755	68.6489	67.8351	74.3311	76.5610	81.2587	(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	96.6591	96.6591	96.6591	96.6591	96.6591	96.6591	96.6591	96.6591	96.6591	96.6591	96.6591	96.6591	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	15.0344	13.3534	10.8597	8.2215	6.1457	5.1884	5.6063	7.2873	9.7810	12.4192	14.4950	15.4522	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	168.6400	170.3900	165.9802	156.5922	144.7415	133.6035	126.1627	124.4127	128.8225	138.2105	150.0612	161.1992	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	32.6659	32.6659	32.6659	32.6659	32.6659	32.6659	32.6659	32.6659	32.6659	32.6659	32.6659	32.6659	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-77.3273	-77.3273	-77.3273	-77.3273	-77.3273	-77.3273	-77.3273	-77.3273	-77.3273	-77.3273	-77.3273	-77.3273	(71)
Water heating gains (Table 5)													
	111.1586	109.2106	105.1654	99.6660	96.0955	91.0682	86.7951	92.2701	94.2154	99.9074	106.3347	109.2187	(72)
Total internal gains													
	346.8308	344.9517	334.0030	316.4774	298.9804	281.8579	270.5618	275.9678	284.8166	302.5349	322.8887	337.8679	(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	8.4000	19.6403	0.3700	0.8900	0.7700	37.6488	(80)
West	3.8000	19.6403	0.3700	0.6800	0.7700	13.0129	(80)

Solar gains	50.6618	99.1051	163.2121	238.0351	291.7209	298.6282	284.3063	244.2149	189.8224	117.5966	63.1693	41.6618	(83)
Total gains	397.4925	444.0569	497.2151	554.5124	590.7013	580.4861	554.8680	520.1827	474.6390	420.1315	386.0580	379.5297	(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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	150.5603	150.7904	151.0212	152.1858	152.4209	153.6073	153.6073	153.8468	153.1305	152.4209	151.9514	151.4849	
alpha	11.0374	11.0527	11.0681	11.1457	11.1614	11.2405	11.2405	11.2565	11.2087	11.1614	11.1301	11.0990	
util living area													
	1.0000	1.0000	1.0000	0.9996	0.9917	0.8930	0.6805	0.7524	0.9832	0.9999	1.0000	1.0000	(86)
MIT	20.3967	20.4538	20.5639	20.7190	20.8747	20.9812	20.9991	20.9974	20.9267	20.7274	20.5348	20.3863	(87)
Th 2	19.6811	19.6829	19.6846	19.6932	19.6950	19.7036	19.7036	19.7054	19.7002	19.6950	19.6915	19.6880	(88)
util rest of house													
	1.0000	1.0000	0.9999	0.9988	0.9715	0.7495	0.4821	0.5466	0.9270	0.9996	1.0000	1.0000	(89)
MIT 2	18.8932	18.9783	19.1410	19.3752	19.5953	19.6996	19.7036	19.7052	19.6636	19.3893	19.1043	18.8839	(90)
Living area fraction									fLA = Living area / (4) =			0.4837	(91)
MIT	19.6204	19.6920	19.8293	20.0252	20.2142	20.3195	20.3302	20.3303	20.2746	20.0366	19.7963	19.6106	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6204	19.6920	19.8293	20.0252	20.2142	20.3195	20.3302	20.3303	20.2746	20.0366	19.7963	19.6106	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	1.0000	1.0000	1.0000	0.9991	0.9825	0.8257	0.5790	0.6485	0.9611	0.9997	1.0000	1.0000	(94)
Useful gains	397.4921	444.0548	497.1928	554.0356	580.3593	479.3155	321.2495	337.3259	456.1525	420.0136	386.0559	379.5295	(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													
	1347.3458	1298.8850	1168.6547	967.9444	739.6329	493.0203	321.5434	338.2620	533.9024	819.7606	1106.3429	1347.0062	(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													
	706.6911	574.4459	499.5677	298.0144	118.4995	0.0000	0.0000	0.0000	0.0000	297.4117	518.6066	719.8027	(98)
Space heating												3733.0396	(98)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Space heating per m2		(98) / (4) =	64.0316 (99)

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)			0.0000 (301)
Fraction of space heat from community system			1.0000 (302)
Fraction of heat from community Heat pump			0.5000 (303a)
Fraction of heat from community Boilers			0.5000 (303b)
Fraction of total space heat from community Heat pump			0.5000 (304a)
Fraction of total space heat from community Boilers			0.5000 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating			1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating			1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system			1.1000 (306)
Space heating:			
Annual space heating requirement			3733.0396 (98)
Space heat from Heat pump = (98) x 0.50 x 1.00 x 1.10			2053.1718 (307a)
Space heat from Boilers = (98) x 0.50 x 1.00 x 1.10			2053.1718 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)			0.0000 (308)
Space heating fuel for secondary/supplementary system			0.0000 (309)
Water heating			
Annual water heating requirement			1870.8285 (64)
Water heat from Heat pump = (64) x 0.50 x 1.00 x 1.10			1028.9557 (310a)
Water heat from Boilers = (64) x 0.50 x 1.00 x 1.10			1028.9557 (310b)
Electricity used for heat distribution			61.6425 (313)
Annual totals kWh/year			
Electricity for pumps and fans:			
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.2500, SFP = 0.6625)			
mechanical ventilation fans (SFP = 0.6625)			113.0903 (330a)
Total electricity for the above, kWh/year			113.0903 (331)
Electricity for lighting (calculated in Appendix L)			265.5119 (332)
Energy saving/generation technologies (Appendices M ,N and Q)			
PV Unit 0 (0.80 * 0.49 * 951 * 1.00) =		-372.6415	-372.6415 (333)
Total delivered energy for all uses			6170.2157 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			342.0000	(367a)
Space heating from Heat pump	901.2069	0.5190	467.7264	(367)
Efficiency of heat source Boilers			93.9000	(367b)
Space heating from Boilers	3282.3509	0.2160	708.9878	(368)
Electrical energy for heat distribution	61.6425	0.5190	31.9925	(372)
Total CO2 associated with community systems			1208.7066	(373)
(negative value allowed since DFEE <= TFEE)				
Space and water heating			1208.7066	(376)
Pumps and fans	113.0903	0.5190	58.6939	(378)
Energy for lighting	265.5119	0.5190	137.8007	(379)
Energy saving/generation technologies				
PV Unit	-372.6415	0.5190	-193.4009	(380)
Total CO2, kg/year			1211.8003	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			20.7900	(384)

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

DER		20.7900	ZC1
Total Floor Area	TFA	58.3000	
Assumed number of occupants	N	1.9332	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.1411	ZC2
CO2 emissions from cooking, equation (L16)		2.8370	ZC3
Total CO2 emissions		40.7681	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		40.7681	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	58.3000 (1b)	x	2.4000 (2b)	=	139.9200	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	58.3000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	139.9200	(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)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1429	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3929	(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) =	0.3045	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3883	0.3807	0.3730	0.3350	0.3274	0.2893	0.2893	0.2817	0.3045	0.3274	0.3426	0.3578	(22b)
Effective ac	0.5754	0.5725	0.5696	0.5561	0.5536	0.5418	0.5418	0.5397	0.5464	0.5536	0.5587	0.5640	(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 Semi-glazed door			2.1000	1.2000	2.5200			(26a)
TER Opening Type (Uw = 1.40)			12.2000	1.3258	16.1742			(27)
External Wall 1	41.0000	12.2000	28.8000	0.1800	5.1840			(29a)
Corridor Wall	277.0000	2.1000	274.9000	0.1800	49.4820			(29a)
Exposed ceiling	6.7000		6.7000	0.1300	0.8710			(30)
Total net area of external elements Aum(A, m2)			324.7000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		74.2312			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	9.3348	(36)
Total fabric heat loss (33) + (36) =	83.5660	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.5673	26.4321	26.2996	25.6774	25.5610	25.0191	25.0191	24.9187	25.2278	25.5610	25.7965	26.0427	(38)
Heat transfer coeff	110.1333	109.9982	109.8657	109.2435	109.1270	108.5851	108.5851	108.4847	108.7938	109.1270	109.3625	109.6088	(39)
Average = Sum(39)m / 12 =												109.2429	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.8891	1.8868	1.8845	1.8738	1.8718	1.8625	1.8625	1.8608	1.8661	1.8718	1.8759	1.8801	(40)
HLP (average)												1.8738	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.9332 (42)
Average daily hot water use (litres/day)	80.1131 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	88.1244	84.9199	81.7154	78.5108	75.3063	72.1018	72.1018	75.3063	78.5108	81.7154	84.9199	88.1244	(44)
Energy conte	130.6859	114.2988	117.9461	102.8283	98.6662	85.1414	78.8960	90.5343	91.6156	106.7691	116.5469	126.5624	(45)
Energy content (annual)										Total = Sum(45)m =		1260.4909	(45)
Distribution loss (46)m = 0.15 x (45)m	19.6029	17.1448	17.6919	15.4242	14.7999	12.7712	11.8344	13.5801	13.7423	16.0154	17.4820	18.9844	(46)

Water storage loss:	
Store volume	2.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	0.2388 (48)
Temperature factor from Table 2b	0.5400 (49)
Enter (49) or (54) in (55)	0.1290 (55)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss
3.9977 3.6109 3.9977 3.8688 3.9977 3.8688 3.9977 3.9977 3.8688 3.9977 3.8688 3.9977 (56)
If cylinder contains dedicated solar storage
3.9977 3.6109 3.9977 3.8688 3.9977 3.8688 3.9977 3.9977 3.8688 3.9977 3.8688 3.9977 (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
157.9461 138.9208 145.2062 129.2090 125.9263 111.5222 106.1562 117.7945 117.9964 134.0293 142.9277 153.8225 (62)
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
157.9461 138.9208 145.2062 129.2090 125.9263 111.5222 106.1562 117.7945 117.9964 134.0293 142.9277 153.8225 (64)
Total per year (kWh/year) = Sum(64)m = 1581.4571 (64)
Heat gains from water heating, kWh/month
65.2612 57.7020 61.0252 55.2950 54.6146 49.4141 48.0410 51.9108 51.5668 57.3089 59.8565 63.8901 (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	96.6591	96.6591	96.6591	96.6591	96.6591	96.6591	96.6591	96.6591	96.6591	96.6591	96.6591	96.6591	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
15.0794 13.3934 10.8922 8.2461 6.1641 5.2040 5.6231 7.3091 9.8102 12.4564 14.5384 15.4985 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
168.6400 170.3900 165.9802 156.5922 144.7415 133.6035 126.1627 124.4127 128.8225 138.2105 150.0612 161.1992 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
32.6659 32.6659 32.6659 32.6659 32.6659 32.6659 32.6659 32.6659 32.6659 32.6659 32.6659 32.6659 (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)
-77.3273 -77.3273 -77.3273 -77.3273 -77.3273 -77.3273 -77.3273 -77.3273 -77.3273 -77.3273 -77.3273 -77.3273 (71)
Water heating gains (Table 5)
87.7167 85.8661 82.0231 76.7986 73.4067 68.6308 64.5713 69.7726 71.6206 77.0280 83.1340 85.8738 (72)
Total internal gains
326.4338 324.6472 313.8933 296.6347 279.3100 262.4360 251.3548 256.4921 265.2511 282.6927 302.7314 317.5692 (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	12.2000	19.6403	0.6300	0.7000	0.7700	73.2283	(80)

Solar gains 73.2283 143.2501 235.9125 344.0643 421.6637 431.6479 410.9464 352.9969 274.3760 169.9783 91.3071 60.2194 (83)
Total gains 399.6622 467.8973 549.8058 640.6990 700.9738 694.0838 662.3011 609.4890 539.6271 452.6710 394.0384 377.7886 (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	36.7610	36.8062	36.8506	37.0604	37.1000	37.2851	37.2851	37.3196	37.2136	37.1000	37.0201	36.9369	
alpha	3.4507	3.4537	3.4567	3.4707	3.4733	3.4857	3.4857	3.4880	3.4809	3.4733	3.4680	3.4625	

util living area
0.9960 0.9926 0.9833 0.9566 0.8943 0.7775 0.6376 0.6941 0.8846 0.9749 0.9931 0.9967 (86)

MIT	18.9538	19.1443	19.5047	19.9909	20.4476	20.7786	20.9209	20.8916	20.6105	20.0125	19.3939	18.9172	(87)
Th 2	19.4083	19.4099	19.4115	19.4188	19.4202	19.4266	19.4266	19.4277	19.4241	19.4202	19.4174	19.4145	(88)

util rest of house
0.9945 0.9898 0.9765 0.9371 0.8418 0.6581 0.4458 0.5082 0.8035 0.9601 0.9900 0.9955 (89)

MIT 2	16.7747	17.0530	17.5768	18.2750	18.8939	19.2860	19.4022	19.3887	19.1201	18.3193	17.4232	16.7248	(90)

Living area fraction fLA = Living area / (4) = 0.4837 (91)

MIT	17.8287	18.0646	18.5093	19.1050	19.6454	20.0080	20.1368	20.1156	19.8410	19.1383	18.3764	17.7853	(92)

Temperature adjustment 0.0000
adjusted MIT 17.8287 18.0646 18.5093 19.1050 19.6454 20.0080 20.1368 20.1156 19.8410 19.1383 18.3764 17.7853 (93)

---
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9922	0.9862	0.9711	0.9321	0.8509	0.7082	0.5399	0.5986	0.8299	0.9564	0.9869	0.9935	(94)
Useful gains	396.5341	461.4562	533.9265	597.1897	596.4385	491.5489	357.6087	364.8372	447.8242	432.9254	388.8789	375.3416	(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
1489.9660 1448.0808 1319.4110 1114.8299 867.0583 587.2276 384.0469 403.0911 624.5879 931.7603 1233.2190 1489.0642 (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
813.5133 663.0117 584.4004 372.7009 201.3411 0.0000 0.0000 0.0000 0.0000 371.1332 607.9249 828.6096 (98)
Space heating 4442.6351 (98)
Space heating per m2 (98) / (4) = 76.2030 (99)

8c. Space cooling requirement

Not applicable

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												4751.4814	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	813.5133	663.0117	584.4004	372.7009	201.3411	0.0000	0.0000	0.0000	0.0000	371.1332	607.9249	828.6096	(98)
Space heating efficiency (main heating system 1)													
	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)													
	870.0677	709.1034	625.0272	398.6106	215.3381	0.0000	0.0000	0.0000	0.0000	396.9339	650.1870	886.2135	(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													
	157.9461	138.9208	145.2062	129.2090	125.9263	111.5222	106.1562	117.7945	117.9964	134.0293	142.9277	153.8225	(64)
Efficiency of water heater												79.8000	(216)
(217)m	88.5692	88.4456	88.1477	87.4803	86.0599	79.8000	79.8000	79.8000	79.8000	87.3910	88.2476	88.6391	(217)
Fuel for water heating, kWh/month													
	178.3308	157.0692	164.7305	147.7007	146.3241	139.7521	133.0278	147.6121	147.8651	153.3673	161.9621	173.5380	(219)
Water heating fuel used												1851.2799	(219)
Annual totals kWh/year													
Space heating fuel - main system												4751.4814	(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)												266.3071	(232)
Total delivered energy for all uses												6944.0683	(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	4751.4814	0.2160	1026.3200	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1851.2799	0.2160	399.8765	(264)
Space and water heating			1426.1964	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	266.3071	0.5190	138.2134	(268)
Total CO2, kg/m2/year			1603.3348	(272)
Emissions per m2 for space and water heating			24.4631	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.3707	(272b)
Emissions per m2 for pumps and fans			0.6677	(272c)
Target Carbon Dioxide Emission Rate (TER) = (24.4631 * 1.00) + 2.3707 + 0.6677, rounded to 2 d.p.			27.5000	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	A-3-05	**Issued on Date**	05/02/2020
Assessment Reference	ASHP-1-2	**Prop Type Ref**	2bed 3F
Property			

SAP Rating	86 B	**DER**	11.44	**TER**	17.36
Environmental	92 A	**% DER<TER**	34.09		
CO_2 Emissions (t/year)	0.60	**DFEE**	45.21	**TFEE**	48.34
General Requirements Compliance	Fail	**% DFEE<TFEE**	6.46		

Assessor Details	Miss Claudia Cioli, Claudia Cioli, Tel: 07481524839, clacioli@gmail.com	**Assessor ID**	R479-0001
Client			

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

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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England
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DWELLING AS DESIGNED

Mid-floor flat, total floor area 68 m²

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

1a TER and DER
Fuels for main heating:Mains gas (c), Electricity (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 17.36 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 11.44 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)48.3 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)45.2 kWh/m²/yrOK

---
2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.18 (max. 0.20)	0.18 (max. 0.35)	OK
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction

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

---
4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage Measured cylinder loss: 0.74 kWh/day
Permitted by DBSCG 0.32 Fail
Primary pipework insulated: No primary pipework

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

Hot water controls: No cylinderstat

---
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: 94%
Minimum: 70% OK

---
9 Summertime temperature
Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing South East: 7.61 m², No overhang
Windows facing South: 3.80 m², No overhang
Windows facing West: 8.40 m², No overhang
Air change rate: 0.50 ach
Blinds/curtains: None

---
10 Key features
Party wall U-value 0.00 W/m²K
Air permeability 3.0 m³/m²h
Photovoltaic array 0.49 kW

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	68.1000 (1b)	x	2.4000 (2b)	=	163.4400	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.1000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	163.4400	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							0 * 10 =	0.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.0000	
Infiltration rate		0.1500	(18)
Number of sides sheltered		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

If mechanical ventilation:	0.5000	(23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	79.9000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2774	0.2739	0.2705	0.2531	0.2497	0.2323	0.2323	0.2288	0.2393	0.2497	0.2566	0.2635	(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	
W03 (Uw = 1.40)			8.4000	1.3258	11.1364			(27)
W02 (Uw = 1.40)			11.4100	1.3258	15.1269			(27)
door			2.1000	1.4000	2.9400			(26a)
External Wall 1	62.2000	19.8100	42.3900	0.1500	6.3585	140.0000	5934.6000	(29a)
Corridor wall	4.1500	2.1000	2.0500	0.1409	0.2889	110.0000	225.5000	(29a)
Exposed ceiling	9.6000		9.6000	0.1800	1.7280	9.0000	86.4000	(30)
Total net area of external elements Aum(A, m2)			75.9500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	37.5786			(33)
Party Wall 1			31.9000	0.0000	0.0000	140.0000	4466.0000	(32)
Party Floor			68.1000			80.0000	5448.0000	(32d)
Party Ceilings			58.5000			80.0000	4680.0000	(32b)
Internal Wall			109.6000			9.0000	986.4000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 21826.9000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	320.5125	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	18.3210	(36)
Total fabric heat loss	(33) + (36) = 55.8996	(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	14.9620	14.7749	14.5878	13.6523	13.4653	12.5298	12.5298	12.3427	12.9040	13.4653	13.8394	14.2136	(38)
Heat transfer coeff	70.8616	70.6745	70.4874	69.5520	69.3649	68.4294	68.4294	68.2424	68.8036	69.3649	69.7391	70.1132	(39)
Average = Sum(39)m / 12 =												69.5052	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0406	1.0378	1.0351	1.0213	1.0186	1.0048	1.0048	1.0021	1.0103	1.0186	1.0241	1.0296	(40)
HLP (average)												1.0206	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.1991 (42)
Average daily hot water use (litres/day)	90.9782 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	100.0760	96.4369	92.7978	89.1586	85.5195	81.8804	81.8804	85.5195	89.1586	92.7978	96.4369	100.0760	(44)
Energy conte	148.4098	129.8002	133.9422	116.7740	112.0475	96.6884	89.5960	102.8128	104.0407	121.2494	132.3532	143.7270	(45)
Energy content (annual)										Total = Sum(45)m =		1431.4411	(45)
Distribution loss (46)m = 0.15 x (45)m													
	22.2615	19.4700	20.0913	17.5161	16.8071	14.5033	13.4394	15.4219	15.6061	18.1874	19.8530	21.5590	(46)
Water storage loss:													
Store volume												2.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.7400	(48)
Temperature factor from Table 2b												1.0000	(49)
Enter (49) or (54) in (55)												0.7400	(55)
Total storage loss													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(56)
If cylinder contains dedicated solar storage													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(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													
	194.6122	171.5314	180.1446	161.4860	158.2499	141.4004	135.7984	149.0152	148.7527	167.4518	177.0652	189.9294	(62)
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													
	194.6122	171.5314	180.1446	161.4860	158.2499	141.4004	135.7984	149.0152	148.7527	167.4518	177.0652	189.9294	(64)
									Total per year (kWh/year) = Sum(64)m =			1975.4371	(64)
Heat gains from water heating, kWh/month													
	86.3082	76.5435	81.4977	74.5970	74.2177	67.9185	66.7526	71.1472	70.3631	77.2773	79.7770	84.7511	(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	109.9564	109.9564	109.9564	109.9564	109.9564	109.9564	109.9564	109.9564	109.9564	109.9564	109.9564	109.9564	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	17.1903	15.2682	12.4170	9.4004	7.0269	5.9324	6.4102	8.3322	11.1835	14.2000	16.5735	17.6680	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	192.8226	194.8235	189.7813	179.0470	165.4970	152.7619	144.2540	142.2532	147.2953	158.0296	171.5796	184.3147	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.9956	33.9956	33.9956	33.9956	33.9956	33.9956	33.9956	33.9956	33.9956	33.9956	33.9956	33.9956	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	(71)
Water heating gains (Table 5)													
	116.0056	113.9040	109.5399	103.6069	99.7550	94.3313	89.7212	95.6279	97.7266	103.8674	110.8014	113.9128	(72)
Total internal gains													
	382.0054	379.9827	367.7251	348.0413	328.2658	309.0125	296.3724	302.2002	312.1923	332.0839	354.9415	371.8825	(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	8.4000	19.6403	0.3700	0.8900	0.7700	37.6488	(80)
Southeast	7.6100	36.7938	0.5600	0.6800	0.7700	73.8907	(77)
South	3.8000	46.7521	0.5600	0.6800	0.7700	46.8829	(78)

Solar gains	158.4225	276.2945	391.3080	500.8150	570.9840	570.0534	548.3507	496.3150	429.7043	309.3133	191.0200	134.7068	(83)
Total gains	540.4278	656.2771	759.0330	848.8563	899.2499	879.0659	844.7231	798.5152	741.8966	641.3972	545.9614	506.5893	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	85.5616	85.7881	86.0158	87.1726	87.4077	88.6026	88.6026	88.8455	88.1208	87.4077	86.9388	86.4748	
alpha	6.7041	6.7192	6.7344	6.8115	6.8272	6.9068	6.9068	6.9230	6.8747	6.8272	6.7959	6.7650	
util living area													
	0.9972	0.9894	0.9614	0.8682	0.6947	0.4962	0.3563	0.3928	0.6289	0.9174	0.9911	0.9981	(86)
MIT	20.2612	20.4397	20.6646	20.8797	20.9765	20.9979	20.9998	20.9997	20.9906	20.8470	20.5078	20.2281	(87)
Th 2	20.0497	20.0519	20.0542	20.0656	20.0679	20.0793	20.0793	20.0816	20.0747	20.0679	20.0633	20.0588	(88)
util rest of house													
	0.9960	0.9852	0.9475	0.8301	0.6336	0.4258	0.2818	0.3146	0.5498	0.8823	0.9869	0.9973	(89)
MIT 2	19.0796	19.3393	19.6573	19.9444	20.0498	20.0783	20.0793	20.0815	20.0693	19.9149	19.4485	19.0385	(90)
Living area fraction									fLA = Living area / (4) =			0.4581	(91)
MIT	19.6209	19.8435	20.1188	20.3729	20.4744	20.4996	20.5010	20.5022	20.4914	20.3419	19.9338	19.5835	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6209	19.8435	20.1188	20.3729	20.4744	20.4996	20.5010	20.5022	20.4914	20.3419	19.9338	19.5835	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9953	0.9841	0.9486	0.8435	0.6608	0.4581	0.3159	0.3504	0.5860	0.8938	0.9861	0.9968	(94)
Useful gains	537.8893	645.8521	720.0142	715.9934	594.2683	402.6947	266.8802	279.8121	434.7547	573.2870	538.3992	504.9669	(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													
	1085.6659	1056.1215	959.9541	797.9637	608.6360	403.7081	266.9442	279.9404	439.7517	675.7485	895.0202	1078.5859	(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													
	407.5457	275.7010	178.5153	59.0186	10.6896	0.0000	0.0000	0.0000	0.0000	76.2314	256.7671	426.7725	(98)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Space heating		1691.2413 (98)
Space heating per m2	(98) / (4) =	24.8347 (99)

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.4600 (303a)
Fraction of heat from community Boilers	0.5400 (303b)
Fraction of total space heat from community Heat pump	0.4600 (304a)
Fraction of total space heat from community Boilers	0.5400 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	1691.2413 (98)
Space heat from Heat pump = (98) x 0.46 x 1.00 x 1.05	816.8696 (307a)
Space heat from Boilers = (98) x 0.54 x 1.00 x 1.05	958.9338 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1975.4371 (64)
Water heat from Heat pump = (64) x 0.46 x 1.00 x 1.05	954.1361 (310a)
Water heat from Boilers = (64) x 0.54 x 1.00 x 1.05	1120.0729 (310b)
Electricity used for heat distribution	38.5001 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.2500, SFP = 0.6625)	
mechanical ventilation fans (SFP = 0.6625)	132.1004 (330a)
Total electricity for the above, kWh/year	132.1004 (331)
Electricity for lighting (calculated in Appendix L)	303.5856 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV Unit 0 (0.80 * 0.49 * 951 * 1.00) = -372.6415	-372.6415 (333)
Total delivered energy for all uses	3913.0569 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			370.0000	(367a)
Space heating from Heat pump	478.6502	0.5190	248.4194	(367)
Efficiency of heat source Boilers			93.9000	(367b)
Space heating from Boilers	2214.0646	0.2160	478.2380	(368)
Electrical energy for heat distribution	38.5001	0.5190	19.9816	(372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			746.6390	(373)
Space and water heating			746.6390	(376)
Pumps and fans	132.1004	0.5190	68.5601	(378)
Energy for lighting	303.5856	0.5190	157.5609	(379)
Energy saving/generation technologies				
PV Unit	-372.6415	0.5190	-193.4009	(380)
Total CO2, kg/year			779.3591	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			11.4400	(384)

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

DER		11.4400	ZC1
Total Floor Area	TFA	68.1000	
Assumed number of occupants	N	2.1991	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.7786	ZC2
CO2 emissions from cooking, equation (L16)		2.5225	ZC3
Total CO2 emissions		30.7411	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		30.7411	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	68.1000 (1b)	x	2.4000 (2b)	=	163.4400	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.1000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	163.4400	(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)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1224	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3724	(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) =	0.3444	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4392	0.4306	0.4219	0.3789	0.3703	0.3272	0.3272	0.3186	0.3444	0.3703	0.3875	0.4047	(22b)
Effective ac	0.5964	0.5927	0.5890	0.5718	0.5686	0.5535	0.5535	0.5508	0.5593	0.5686	0.5751	0.5819	(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 Semi-glazed door			2.1000	1.2000	2.5200			(26a)
TER Opening Type (Uw = 1.40)			14.9200	1.3258	19.7803			(27)
External Wall 1	62.2000	14.9200	47.2800	0.1800	8.5104			(29a)
Corridor wall	4.1500	2.1000	2.0500	0.1800	0.3690			(29a)
Exposed ceiling	9.6000		9.6000	0.1300	1.2480			(30)
Total net area of external elements Aum(A, m2)			75.9500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.4277			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							16.0085	(36)
Total fabric heat loss					(33) + (36) =		48.4362	(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	32.1687	31.9667	31.7687	30.8389	30.6649	29.8551	29.8551	29.7051	30.1670	30.6649	31.0169	31.3848	(38)
Heat transfer coeff	80.6049	80.4029	80.2050	79.2751	79.1011	78.2913	78.2913	78.1413	78.6032	79.1011	79.4531	79.8210	(39)
Average = Sum(39)m / 12 =												79.2743	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1836	1.1807	1.1778	1.1641	1.1615	1.1497	1.1497	1.1474	1.1542	1.1615	1.1667	1.1721	(40)
HLP (average)												1.1641	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1991	(42)
Average daily hot water use (litres/day)												86.4293	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.0722	91.6150	88.1579	84.7007	81.2435	77.7863	77.7863	81.2435	84.7007	88.1579	91.6150	95.0722	(44)
Energy conte	140.9893	123.3102	127.2451	110.9353	106.4451	91.8540	85.1162	97.6721	98.8386	115.1869	125.7355	136.5406	(45)
Energy content (annual)										Total = Sum(45)m =		1359.8691	(45)
Distribution loss (46)m = 0.15 x (45)m	21.1484	18.4965	19.0868	16.6403	15.9668	13.7781	12.7674	14.6508	14.8258	17.2780	18.8603	20.4811	(46)
Water storage loss:													
Store volume												2.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.2388	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.1290	(55)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss
3.9977 3.6109 3.9977 3.8688 3.9977 3.8688 3.9977 3.9977 3.8688 3.9977 3.8688 3.9977 (56)
If cylinder contains dedicated solar storage
3.9977 3.6109 3.9977 3.8688 3.9977 3.8688 3.9977 3.9977 3.8688 3.9977 3.8688 3.9977 (57)
Primary loss 23.2624 21.0112 23.2624 22.5120 23.2624 22.5120 23.2624 23.2624 22.5120 23.2624 22.5120 23.2624 (59)
Total heat required for water heating calculated for each month
168.2495 147.9322 154.5052 137.3161 133.7052 118.2348 112.3764 124.9323 125.2194 142.4471 152.1163 163.8008 (62)
Solar input 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)
Output from w/h
168.2495 147.9322 154.5052 137.3161 133.7052 118.2348 112.3764 124.9323 125.2194 142.4471 152.1163 163.8008 (64)
Total per year (kWh/year) = Sum(64)m = 1680.8353 (64)
Heat gains from water heating, kWh/month
68.6871 60.6983 64.1171 57.9906 57.2011 51.6461 50.1093 54.2841 53.9685 60.1078 62.9117 67.2079 (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	109.9564	109.9564	109.9564	109.9564	109.9564	109.9564	109.9564	109.9564	109.9564	109.9564	109.9564	109.9564	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	17.1986	15.2756	12.4230	9.4050	7.0303	5.9353	6.4133	8.3363	11.1889	14.2069	16.5816	17.6766	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	192.8226	194.8235	189.7813	179.0470	165.4970	152.7619	144.2540	142.2532	147.2953	158.0296	171.5796	184.3147	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.9956	33.9956	33.9956	33.9956	33.9956	33.9956	33.9956	33.9956	33.9956	33.9956	33.9956	33.9956	(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)													
	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	(71)
Water heating gains (Table 5)													
	92.3213	90.3248	86.1789	80.5425	76.8832	71.7307	67.3512	72.9625	74.9562	80.7900	87.3773	90.3332	(72)
Total internal gains													
	361.3294	359.4108	347.3701	327.9815	308.3975	289.4148	277.0054	282.5388	292.4274	312.0134	334.5254	351.3114	(73)

---
6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	5.7300	36.7938	0.6300	0.7000	0.7700	64.4320	(77)
South	2.8600	46.7521	0.6300	0.7000	0.7700	40.8638	(78)
West	6.3300	19.6403	0.6300	0.7000	0.7700	37.9947	(80)

Solar gains	143.2905	251.0015	357.8203	460.9333	527.5918	527.4862	507.1024	457.6414	394.0130	281.6767	172.9871	121.6954	(83)
Total gains	504.6199	610.4124	705.1904	788.9148	835.9893	816.9010	784.1078	740.1802	686.4404	593.6901	507.5125	473.0068	(84)

---
7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.6710	58.8183	58.9635	59.6551	59.7863	60.4048	60.4048	60.5207	60.1650	59.7863	59.5215	59.2471	
alpha	4.9114	4.9212	4.9309	4.9770	4.9858	5.0270	5.0270	5.0347	5.0110	4.9858	4.9681	4.9498	
util living area													
	0.9949	0.9868	0.9648	0.9026	0.7756	0.5919	0.4354	0.4790	0.7229	0.9362	0.9885	0.9963	(86)
MIT	19.8431	20.0508	20.3378	20.6600	20.8799	20.9758	20.9957	20.9932	20.9364	20.6328	20.1713	19.8053	(87)
Th 2	19.9331	19.9355	19.9378	19.9488	19.9509	19.9605	19.9605	19.9623	19.9568	19.9509	19.9467	19.9424	(88)
util rest of house													
	0.9933	0.9825	0.9536	0.8731	0.7162	0.5048	0.3346	0.3744	0.6378	0.9099	0.9841	0.9950	(89)
MIT 2	18.4096	18.7119	19.1232	19.5718	19.8422	19.9457	19.9590	19.9597	19.9113	19.5488	18.8971	18.3613	(90)
Living area fraction									fLA = Living area / (4) =			0.4581	(91)
MIT	19.0664	19.3253	19.6797	20.0704	20.3176	20.4177	20.4340	20.4332	20.3810	20.0454	19.4809	19.0229	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0664	19.3253	19.6797	20.0704	20.3176	20.4177	20.4340	20.4332	20.3810	20.0454	19.4809	19.0229	(93)

---
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9914	0.9794	0.9503	0.8769	0.7382	0.5441	0.3809	0.4224	0.6743	0.9127	0.9816	0.9936	(94)
Useful gains	500.2966	597.8508	670.1137	691.7893	617.1611	444.4586	298.6788	312.6867	462.8706	541.8395	498.1606	469.9581	(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													
	1190.2402	1159.8384	1057.0747	885.5330	681.6656	455.4733	300.1674	315.1596	493.7039	747.1442	983.6980	1183.1778	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	513.3180	377.6556	287.8990	139.4955	47.9913	0.0000	0.0000	0.0000	0.0000	152.7467	349.5869	530.6354	(98)
Space heating												2399.3285	(98)
Space heating per m2											(98) / (4) =	35.2324	(99)

8c. Space cooling requirement

Not applicable

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												2566.1267	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	513.3180	377.6556	287.8990	139.4955	47.9913	0.0000	0.0000	0.0000	0.0000	152.7467	349.5869	530.6354	(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)													
	549.0032	403.9098	307.9134	149.1930	51.3276	0.0000	0.0000	0.0000	0.0000	163.3654	373.8897	567.5245	(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													
	168.2495	147.9322	154.5052	137.3161	133.7052	118.2348	112.3764	124.9323	125.2194	142.4471	152.1163	163.8008	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.6004	87.2088	86.4517	84.8558	82.3724	79.8000	79.8000	79.8000	79.8000	85.0002	86.9645	87.7255	(217)
Fuel for water heating, kWh/month													
	192.0646	169.6300	178.7186	161.8228	162.3181	148.1639	140.8225	156.5567	156.9166	167.5844	174.9177	186.7198	(219)
Water heating fuel used												1996.2358	(219)
Annual totals kWh/year													
Space heating fuel - main system												2566.1267	(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)												303.7325	(232)
Total delivered energy for all uses												4941.0950	(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	2566.1267	0.2160	554.2834	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1996.2358	0.2160	431.1869	(264)
Space and water heating			985.4703	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	303.7325	0.5190	157.6372	(268)
Total CO2, kg/m2/year			1182.0325	(272)
Emissions per m2 for space and water heating			14.4709	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.3148	(272b)
Emissions per m2 for pumps and fans			0.5716	(272c)
Target Carbon Dioxide Emission Rate (TER) = (14.4709 * 1.00) + 2.3148 + 0.5716, rounded to 2 d.p.			17.3600	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	A-3-06	**Issued on Date**	05/02/2020
Assessment Reference	ASHP-1-2	**Prop Type Ref**	2bed 3F
Property			

SAP Rating	86 B	**DER**	11.44	**TER**	17.36
Environmental	92 A	**% DER<TER**	34.09		
CO_2 Emissions (t/year)	0.60	**DFEE**	45.21	**TFEE**	48.34
General Requirements Compliance	Fail	**% DFEE<TFEE**	6.46		

Assessor Details	Miss Claudia Cioli, Claudia Cioli, Tel: 07481524839, clacioli@gmail.com	**Assessor ID**	R479-0001
Client			

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DWELLING AS DESIGNED

Mid-floor flat, total floor area 68 m²

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

1a TER and DER
Fuels for main heating:Mains gas (c), Electricity (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 17.36 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 11.44 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)48.3 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)45.2 kWh/m²/yrOK

---
2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.18 (max. 0.20)	0.18 (max. 0.35)	OK
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction

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

---
4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage Measured cylinder loss: 0.74 kWh/day
Permitted by DBSCG 0.32 Fail
Primary pipework insulated: No primary pipework

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

Hot water controls: No cylinderstat

---
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: 94%
Minimum: 70% OK

---
9 Summertime temperature
Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing South East: 7.61 m², No overhang
Windows facing South: 3.80 m², No overhang
Windows facing West: 8.40 m², No overhang
Air change rate: 0.50 ach
Blinds/curtains: None

---
10 Key features
Party wall U-value 0.00 W/m²K
Air permeability 3.0 m³/m²h
Photovoltaic array 0.49 kW

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	68.1000 (1b)	x	2.4000 (2b)	=	163.4400	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.1000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	163.4400	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							0 * 10 =	0.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.0000	
Infiltration rate		0.1500	(18)
Number of sides sheltered		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

If mechanical ventilation:	0.5000	(23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	79.9000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2774	0.2739	0.2705	0.2531	0.2497	0.2323	0.2323	0.2288	0.2393	0.2497	0.2566	0.2635	(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	
W03 (Uw = 1.40)			8.4000	1.3258	11.1364			(27)
W02 (Uw = 1.40)			11.4100	1.3258	15.1269			(27)
door			2.1000	1.4000	2.9400			(26a)
External Wall 1	62.2000	19.8100	42.3900	0.1500	6.3585	140.0000	5934.6000	(29a)
Corridor wall	4.1500	2.1000	2.0500	0.1409	0.2889	110.0000	225.5000	(29a)
Exposed ceiling	9.6000		9.6000	0.1800	1.7280	9.0000	86.4000	(30)
Total net area of external elements Aum(A, m2)			75.9500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	37.5786			(33)
Party Wall 1			31.9000	0.0000	0.0000	140.0000	4466.0000	(32)
Party Floor			68.1000			80.0000	5448.0000	(32d)
Party Ceilings			58.5000			80.0000	4680.0000	(32b)
Internal Wall			109.6000			9.0000	986.4000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 21826.9000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	320.5125	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	18.3210	(36)
Total fabric heat loss	(33) + (36) = 55.8996	(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	14.9620	14.7749	14.5878	13.6523	13.4653	12.5298	12.5298	12.3427	12.9040	13.4653	13.8394	14.2136	(38)
Heat transfer coeff	70.8616	70.6745	70.4874	69.5520	69.3649	68.4294	68.4294	68.2424	68.8036	69.3649	69.7391	70.1132	(39)
Average = Sum(39)m / 12 =												69.5052	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0406	1.0378	1.0351	1.0213	1.0186	1.0048	1.0048	1.0021	1.0103	1.0186	1.0241	1.0296	(40)
HLP (average)												1.0206	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.1991 (42)
Average daily hot water use (litres/day)	90.9782 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	100.0760	96.4369	92.7978	89.1586	85.5195	81.8804	81.8804	85.5195	89.1586	92.7978	96.4369	100.0760	(44)
Energy conte	148.4098	129.8002	133.9422	116.7740	112.0475	96.6884	89.5960	102.8128	104.0407	121.2494	132.3532	143.7270	(45)
Energy content (annual)										Total = Sum(45)m =		1431.4411	(45)
Distribution loss (46)m = 0.15 x (45)m													
	22.2615	19.4700	20.0913	17.5161	16.8071	14.5033	13.4394	15.4219	15.6061	18.1874	19.8530	21.5590	(46)
Water storage loss:													
Store volume												2.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.7400	(48)
Temperature factor from Table 2b												1.0000	(49)
Enter (49) or (54) in (55)												0.7400	(55)
Total storage loss													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(56)
If cylinder contains dedicated solar storage													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(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													
	194.6122	171.5314	180.1446	161.4860	158.2499	141.4004	135.7984	149.0152	148.7527	167.4518	177.0652	189.9294	(62)
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													
	194.6122	171.5314	180.1446	161.4860	158.2499	141.4004	135.7984	149.0152	148.7527	167.4518	177.0652	189.9294	(64)
									Total per year (kWh/year) = Sum(64)m =			1975.4371	(64)
Heat gains from water heating, kWh/month													
	86.3082	76.5435	81.4977	74.5970	74.2177	67.9185	66.7526	71.1472	70.3631	77.2773	79.7770	84.7511	(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	109.9564	109.9564	109.9564	109.9564	109.9564	109.9564	109.9564	109.9564	109.9564	109.9564	109.9564	109.9564	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	17.1903	15.2682	12.4170	9.4004	7.0269	5.9324	6.4102	8.3322	11.1835	14.2000	16.5735	17.6680	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	192.8226	194.8235	189.7813	179.0470	165.4970	152.7619	144.2540	142.2532	147.2953	158.0296	171.5796	184.3147	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.9956	33.9956	33.9956	33.9956	33.9956	33.9956	33.9956	33.9956	33.9956	33.9956	33.9956	33.9956	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	(71)
Water heating gains (Table 5)													
	116.0056	113.9040	109.5399	103.6069	99.7550	94.3313	89.7212	95.6279	97.7266	103.8674	110.8014	113.9128	(72)
Total internal gains													
	382.0054	379.9827	367.7251	348.0413	328.2658	309.0125	296.3724	302.2002	312.1923	332.0839	354.9415	371.8825	(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	8.4000	19.6403	0.3700	0.8900	0.7700	37.6488	(80)
Southeast	7.6100	36.7938	0.5600	0.6800	0.7700	73.8907	(77)
South	3.8000	46.7521	0.5600	0.6800	0.7700	46.8829	(78)

Solar gains	158.4225	276.2945	391.3080	500.8150	570.9840	570.0534	548.3507	496.3150	429.7043	309.3133	191.0200	134.7068	(83)
Total gains	540.4278	656.2771	759.0330	848.8563	899.2499	879.0659	844.7231	798.5152	741.8966	641.3972	545.9614	506.5893	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	85.5616	85.7881	86.0158	87.1726	87.4077	88.6026	88.6026	88.8455	88.1208	87.4077	86.9388	86.4748	
alpha	6.7041	6.7192	6.7344	6.8115	6.8272	6.9068	6.9068	6.9230	6.8747	6.8272	6.7959	6.7650	
util living area													
	0.9972	0.9894	0.9614	0.8682	0.6947	0.4962	0.3563	0.3928	0.6289	0.9174	0.9911	0.9981	(86)
MIT	20.2612	20.4397	20.6646	20.8797	20.9765	20.9979	20.9998	20.9997	20.9906	20.8470	20.5078	20.2281	(87)
Th 2	20.0497	20.0519	20.0542	20.0656	20.0679	20.0793	20.0793	20.0816	20.0747	20.0679	20.0633	20.0588	(88)
util rest of house													
	0.9960	0.9852	0.9475	0.8301	0.6336	0.4258	0.2818	0.3146	0.5498	0.8823	0.9869	0.9973	(89)
MIT 2	19.0796	19.3393	19.6573	19.9444	20.0498	20.0783	20.0793	20.0815	20.0693	19.9149	19.4485	19.0385	(90)
Living area fraction									fLA = Living area / (4) =			0.4581	(91)
MIT	19.6209	19.8435	20.1188	20.3729	20.4744	20.4996	20.5010	20.5022	20.4914	20.3419	19.9338	19.5835	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6209	19.8435	20.1188	20.3729	20.4744	20.4996	20.5010	20.5022	20.4914	20.3419	19.9338	19.5835	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9953	0.9841	0.9486	0.8435	0.6608	0.4581	0.3159	0.3504	0.5860	0.8938	0.9861	0.9968	(94)
Useful gains	537.8893	645.8521	720.0142	715.9934	594.2683	402.6947	266.8802	279.8121	434.7547	573.2870	538.3992	504.9669	(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													
	1085.6659	1056.1215	959.9541	797.9637	608.6360	403.7081	266.9442	279.9404	439.7517	675.7485	895.0202	1078.5859	(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													
	407.5457	275.7010	178.5153	59.0186	10.6896	0.0000	0.0000	0.0000	0.0000	76.2314	256.7671	426.7725	(98)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Space heating		1691.2413 (98)
Space heating per m2	(98) / (4) =	24.8347 (99)

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.4600 (303a)
Fraction of heat from community Boilers	0.5400 (303b)
Fraction of total space heat from community Heat pump	0.4600 (304a)
Fraction of total space heat from community Boilers	0.5400 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	1691.2413 (98)
Space heat from Heat pump = (98) x 0.46 x 1.00 x 1.05	816.8696 (307a)
Space heat from Boilers = (98) x 0.54 x 1.00 x 1.05	958.9338 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1975.4371 (64)
Water heat from Heat pump = (64) x 0.46 x 1.00 x 1.05	954.1361 (310a)
Water heat from Boilers = (64) x 0.54 x 1.00 x 1.05	1120.0729 (310b)
Electricity used for heat distribution	38.5001 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.2500, SFP = 0.6625)	
mechanical ventilation fans (SFP = 0.6625)	132.1004 (330a)
Total electricity for the above, kWh/year	132.1004 (331)
Electricity for lighting (calculated in Appendix L)	303.5856 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV Unit 0 (0.80 * 0.49 * 951 * 1.00) = -372.6415	-372.6415 (333)
Total delivered energy for all uses	3913.0569 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			370.0000	(367a)
Space heating from Heat pump	478.6502	0.5190	248.4194	(367)
Efficiency of heat source Boilers			93.9000	(367b)
Space heating from Boilers	2214.0646	0.2160	478.2380	(368)
Electrical energy for heat distribution	38.5001	0.5190	19.9816	(372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			746.6390	(373)
Space and water heating			746.6390	(376)
Pumps and fans	132.1004	0.5190	68.5601	(378)
Energy for lighting	303.5856	0.5190	157.5609	(379)
Energy saving/generation technologies				
PV Unit	-372.6415	0.5190	-193.4009	(380)
Total CO2, kg/year			779.3591	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			11.4400	(384)

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

DER		11.4400	ZC1
Total Floor Area	TFA	68.1000	
Assumed number of occupants	N	2.1991	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.7786	ZC2
CO2 emissions from cooking, equation (L16)		2.5225	ZC3
Total CO2 emissions		30.7411	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		30.7411	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	68.1000 (1b)	x	2.4000 (2b)	=	163.4400	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.1000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	163.4400	(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)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1224	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3724	(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) =	0.3444	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4392	0.4306	0.4219	0.3789	0.3703	0.3272	0.3272	0.3186	0.3444	0.3703	0.3875	0.4047	(22b)
Effective ac	0.5964	0.5927	0.5890	0.5718	0.5686	0.5535	0.5535	0.5508	0.5593	0.5686	0.5751	0.5819	(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 Semi-glazed door			2.1000	1.2000	2.5200			(26a)
TER Opening Type (Uw = 1.40)			14.9200	1.3258	19.7803			(27)
External Wall 1	62.2000	14.9200	47.2800	0.1800	8.5104			(29a)
Corridor wall	4.1500	2.1000	2.0500	0.1800	0.3690			(29a)
Exposed ceiling	9.6000		9.6000	0.1300	1.2480			(30)
Total net area of external elements Aum(A, m2)			75.9500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.4277			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							16.0085	(36)
Total fabric heat loss					(33) + (36) =		48.4362	(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	32.1687	31.9667	31.7687	30.8389	30.6649	29.8551	29.8551	29.7051	30.1670	30.6649	31.0169	31.3848	(38)
Heat transfer coeff	80.6049	80.4029	80.2050	79.2751	79.1011	78.2913	78.2913	78.1413	78.6032	79.1011	79.4531	79.8210	(39)
Average = Sum(39)m / 12 =												79.2743	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1836	1.1807	1.1778	1.1641	1.1615	1.1497	1.1497	1.1474	1.1542	1.1615	1.1667	1.1721	(40)
HLP (average)												1.1641	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1991	(42)
Average daily hot water use (litres/day)												86.4293	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.0722	91.6150	88.1579	84.7007	81.2435	77.7863	77.7863	81.2435	84.7007	88.1579	91.6150	95.0722	(44)
Energy conte	140.9893	123.3102	127.2451	110.9353	106.4451	91.8540	85.1162	97.6721	98.8386	115.1869	125.7355	136.5406	(45)
Energy content (annual)										Total = Sum(45)m =		1359.8691	(45)
Distribution loss (46)m = 0.15 x (45)m	21.1484	18.4965	19.0868	16.6403	15.9668	13.7781	12.7674	14.6508	14.8258	17.2780	18.8603	20.4811	(46)
Water storage loss:													
Store volume												2.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.2388	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.1290	(55)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss
3.9977 3.6109 3.9977 3.8688 3.9977 3.8688 3.9977 3.9977 3.8688 3.9977 3.8688 3.9977 (56)
If cylinder contains dedicated solar storage
3.9977 3.6109 3.9977 3.8688 3.9977 3.8688 3.9977 3.9977 3.8688 3.9977 3.8688 3.9977 (57)
Primary loss 23.2624 21.0112 23.2624 22.5120 23.2624 22.5120 23.2624 23.2624 22.5120 23.2624 22.5120 23.2624 (59)
Total heat required for water heating calculated for each month
168.2495 147.9322 154.5052 137.3161 133.7052 118.2348 112.3764 124.9323 125.2194 142.4471 152.1163 163.8008 (62)
Solar input 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)
Output from w/h
168.2495 147.9322 154.5052 137.3161 133.7052 118.2348 112.3764 124.9323 125.2194 142.4471 152.1163 163.8008 (64)
Total per year (kWh/year) = Sum(64)m = 1680.8353 (64)
Heat gains from water heating, kWh/month
68.6871 60.6983 64.1171 57.9906 57.2011 51.6461 50.1093 54.2841 53.9685 60.1078 62.9117 67.2079 (65)

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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	109.9564	109.9564	109.9564	109.9564	109.9564	109.9564	109.9564	109.9564	109.9564	109.9564	109.9564	109.9564	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	17.1986	15.2756	12.4230	9.4050	7.0303	5.9353	6.4133	8.3363	11.1889	14.2069	16.5816	17.6766	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	192.8226	194.8235	189.7813	179.0470	165.4970	152.7619	144.2540	142.2532	147.2953	158.0296	171.5796	184.3147	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.9956	33.9956	33.9956	33.9956	33.9956	33.9956	33.9956	33.9956	33.9956	33.9956	33.9956	33.9956	(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)													
	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	-87.9651	(71)
Water heating gains (Table 5)													
	92.3213	90.3248	86.1789	80.5425	76.8832	71.7307	67.3512	72.9625	74.9562	80.7900	87.3773	90.3332	(72)
Total internal gains													
	361.3294	359.4108	347.3701	327.9815	308.3975	289.4148	277.0054	282.5388	292.4274	312.0134	334.5254	351.3114	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	5.7300	36.7938	0.6300	0.7000	0.7700	64.4320	(77)
South	2.8600	46.7521	0.6300	0.7000	0.7700	40.8638	(78)
West	6.3300	19.6403	0.6300	0.7000	0.7700	37.9947	(80)

Solar gains	143.2905	251.0015	357.8203	460.9333	527.5918	527.4862	507.1024	457.6414	394.0130	281.6767	172.9871	121.6954	(83)
Total gains	504.6199	610.4124	705.1904	788.9148	835.9893	816.9010	784.1078	740.1802	686.4404	593.6901	507.5125	473.0068	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.6710	58.8183	58.9635	59.6551	59.7863	60.4048	60.4048	60.5207	60.1650	59.7863	59.5215	59.2471	
alpha	4.9114	4.9212	4.9309	4.9770	4.9858	5.0270	5.0270	5.0347	5.0110	4.9858	4.9681	4.9498	
util living area													
	0.9949	0.9868	0.9648	0.9026	0.7756	0.5919	0.4354	0.4790	0.7229	0.9362	0.9885	0.9963	(86)
MIT	19.8431	20.0508	20.3378	20.6600	20.8799	20.9758	20.9957	20.9932	20.9364	20.6328	20.1713	19.8053	(87)
Th 2	19.9331	19.9355	19.9378	19.9488	19.9509	19.9605	19.9605	19.9623	19.9568	19.9509	19.9467	19.9424	(88)
util rest of house													
	0.9933	0.9825	0.9536	0.8731	0.7162	0.5048	0.3346	0.3744	0.6378	0.9099	0.9841	0.9950	(89)
MIT 2	18.4096	18.7119	19.1232	19.5718	19.8422	19.9457	19.9590	19.9597	19.9113	19.5488	18.8971	18.3613	(90)
Living area fraction									fLA = Living area / (4) =			0.4581	(91)
MIT	19.0664	19.3253	19.6797	20.0704	20.3176	20.4177	20.4340	20.4332	20.3810	20.0454	19.4809	19.0229	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0664	19.3253	19.6797	20.0704	20.3176	20.4177	20.4340	20.4332	20.3810	20.0454	19.4809	19.0229	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9914	0.9794	0.9503	0.8769	0.7382	0.5441	0.3809	0.4224	0.6743	0.9127	0.9816	0.9936	(94)
Useful gains	500.2966	597.8508	670.1137	691.7893	617.1611	444.4586	298.6788	312.6867	462.8706	541.8395	498.1606	469.9581	(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													
	1190.2402	1159.8384	1057.0747	885.5330	681.6656	455.4733	300.1674	315.1596	493.7039	747.1442	983.6980	1183.1778	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	513.3180	377.6556	287.8990	139.4955	47.9913	0.0000	0.0000	0.0000	0.0000	152.7467	349.5869	530.6354	(98)
Space heating												2399.3285	(98)
Space heating per m2											(98) / (4) =	35.2324	(99)

8c. Space cooling requirement

Not applicable

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												2566.1267	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	513.3180	377.6556	287.8990	139.4955	47.9913	0.0000	0.0000	0.0000	0.0000	152.7467	349.5869	530.6354	(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)													
	549.0032	403.9098	307.9134	149.1930	51.3276	0.0000	0.0000	0.0000	0.0000	163.3654	373.8897	567.5245	(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													
	168.2495	147.9322	154.5052	137.3161	133.7052	118.2348	112.3764	124.9323	125.2194	142.4471	152.1163	163.8008	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.6004	87.2088	86.4517	84.8558	82.3724	79.8000	79.8000	79.8000	79.8000	85.0002	86.9645	87.7255	(217)
Fuel for water heating, kWh/month													
	192.0646	169.6300	178.7186	161.8228	162.3181	148.1639	140.8225	156.5567	156.9166	167.5844	174.9177	186.7198	(219)
Water heating fuel used												1996.2358	(219)
Annual totals kWh/year													
Space heating fuel - main system												2566.1267	(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)												303.7325	(232)
Total delivered energy for all uses												4941.0950	(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	2566.1267	0.2160	554.2834	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1996.2358	0.2160	431.1869	(264)
Space and water heating			985.4703	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	303.7325	0.5190	157.6372	(268)
Total CO2, kg/m2/year			1182.0325	(272)
Emissions per m2 for space and water heating			14.4709	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.3148	(272b)
Emissions per m2 for pumps and fans			0.5716	(272c)
Target Carbon Dioxide Emission Rate (TER) = (14.4709 * 1.00) + 2.3148 + 0.5716, rounded to 2 d.p.			17.3600	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	A-4-01	**Issued on Date**	05/02/2020
Assessment Reference	ASHP-1-2	**Prop Type Ref**	2bed 3F
Property			

SAP Rating	87 B	**DER**	10.78	**TER**	16.29
Environmental	92 A	**% DER<TER**	33.84		
CO_2 Emissions (t/year)	0.77	**DFEE**	46.01	**TFEE**	49.65
General Requirements Compliance	Fail	**% DFEE<TFEE**	7.32		

Assessor Details	Miss Claudia Cioli, Claudia Cioli, Tel: 07481524839, clacioli@gmail.com	**Assessor ID**	R479-0001
Client			

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

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DWELLING AS DESIGNED

Top-floor flat, total floor area 92 m²

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

1a TER and DER
Fuels for main heating:Mains gas (c), Electricity (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 16.29 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 10.78 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)49.6 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)46.0 kWh/m²/yrOK

---
2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	OK
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction

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

---
4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage Nominal cylinder loss: 0.09 kWh/day
Permitted by DBSCG 0.32 OK
Primary pipework insulated: No primary pipework

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

Hot water controls: No cylinderstat

---
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: 94%
Minimum: 70% OK

---
9 Summertime temperature
Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing North East: 12.22 m², No overhang
Windows facing North West: 16.76 m², No overhang
Air change rate: 0.50 ach
Blinds/curtains: None

---
10 Key features
Party wall U-value 0.00 W/m²K
Roof U-value 0.11 W/m²K
Air permeability 3.0 m³/m²h
Photovoltaic array 0.49 kW

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	91.9000 (1b)	x	2.5000 (2b)	=	229.7500	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	91.9000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	229.7500	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							0 * 10 =	0.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.0000	
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	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) =	79.9000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2631	0.2599	0.2567	0.2408	0.2376	0.2216	0.2216	0.2184	0.2280	0.2376	0.2439	0.2503	(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	
W03 (Uw = 1.40)			8.4000	1.3258	11.1364			(27)
W02 (Uw = 1.40)			16.7600	1.3258	22.2197			(27)
door			2.1000	1.4000	2.9400			(26a)
W31 (Uw = 1.40)			3.8200	1.3258	5.0644			(27)
External Wall 1	54.9000	28.9800	25.9200	0.1500	3.8880	140.0000	3628.8000	(29a)
Corridor wall	7.6000	2.1000	5.5000	0.1409	0.7750	110.0000	605.0000	(29a)
roof	91.9000		91.9000	0.1100	10.1090	9.0000	827.1000	(30)
Total net area of external elements Aum(A, m2)			154.4000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	56.1325			(33)
Party Wall 1			38.9000	0.0000	0.0000	140.0000	5446.0000	(32)
Party Floor			91.9000			80.0000	7352.0000	(32d)
Internal Wall			163.4000			9.0000	1470.6000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 19329.5000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	210.3319	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	6.4040	(36)
Total fabric heat loss	(33) + (36) = 62.5365	(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	19.9447	19.7031	19.4614	18.2531	18.0114	16.8031	16.8031	16.5614	17.2864	18.0114	18.4947	18.9781	(38)
Heat transfer coeff	82.4812	82.2395	81.9979	80.7895	80.5479	79.3395	79.3395	79.0979	79.8229	80.5479	81.0312	81.5145	(39)
Average = Sum(39)m / 12 =												80.7291	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8975	0.8949	0.8923	0.8791	0.8765	0.8633	0.8633	0.8607	0.8686	0.8765	0.8817	0.8870	(40)
HLP (average)												0.8784	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6508	(42)
Average daily hot water use (litres/day)	102.2711	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	112.4982	108.4074	104.3165	100.2257	96.1348	92.0440	92.0440	96.1348	100.2257	104.3165	108.4074	112.4982	(44)
Energy conte	166.8316	145.9120	150.5681	131.2689	125.9556	108.6901	100.7174	115.5747	116.9550	136.2998	148.7819	161.5675	(45)
Energy content (annual)										Total = Sum(45)m =		1609.1225	(45)
Distribution loss (46)m = 0.15 x (45)m													
	25.0247	21.8868	22.5852	19.6903	18.8933	16.3035	15.1076	17.3362	17.5433	20.4450	22.3173	24.2351	(46)
Water storage loss:													
Store volume												2.0000	(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												3.9149	(52)
Temperature factor from Table 2b												1.0000	(53)
Enter (49) or (54) in (55)												0.0904	(55)
Total storage loss													
	2.8029	2.5316	2.8029	2.7124	2.8029	2.7124	2.8029	2.8029	2.7124	2.8029	2.7124	2.8029	(56)
If cylinder contains dedicated solar storage													
	2.8029	2.5316	2.8029	2.7124	2.8029	2.7124	2.8029	2.8029	2.7124	2.8029	2.7124	2.8029	(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													
	192.8968	169.4548	176.6333	156.4933	152.0209	133.9146	126.7826	141.6399	142.1794	162.3650	174.0063	187.6327	(62)
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													
	192.8968	169.4548	176.6333	156.4933	152.0209	133.9146	126.7826	141.6399	142.1794	162.3650	174.0063	187.6327	(64)
									Total per year (kWh/year) = Sum(64)m =			1916.0199	(64)
Heat gains from water heating, kWh/month													
	76.3237	67.3500	70.9161	63.8265	62.7325	56.3190	54.3407	59.2808	59.0671	66.1719	69.6495	74.5734	(65)

---

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	132.5422	132.5422	132.5422	132.5422	132.5422	132.5422	132.5422	132.5422	132.5422	132.5422	132.5422	132.5422	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	21.6217	19.2042	15.6179	11.8238	8.8384	7.4618	8.0627	10.4802	14.0665	17.8607	20.8460	22.2227	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	242.5301	245.0468	238.7048	225.2034	208.1603	192.1422	181.4412	178.9245	185.2665	198.7679	215.8110	231.8290	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.2542	36.2542	36.2542	36.2542	36.2542	36.2542	36.2542	36.2542	36.2542	36.2542	36.2542	36.2542	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	(71)
Water heating gains (Table 5)													
	102.5856	100.2232	95.3173	88.6479	84.3178	78.2209	73.0386	79.6785	82.0376	88.9407	96.7355	100.2331	(72)
Total internal gains													
	429.5001	427.2369	412.4027	388.4377	364.0792	340.5875	325.3051	331.8458	344.1333	368.3319	396.1551	417.0474	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	8.4000	11.2829	0.3700	0.8900	0.7700	21.6285	(75)
Northwest	16.7600	11.2829	0.5600	0.6800	0.7700	49.9030	(81)
Northeast	3.8200	11.2829	0.3700	0.8800	0.7700	9.7253	(75)

Solar gains	81.2568	165.4006	297.9992	489.4003	657.8501	701.3378	656.0871	523.0403	363.1167	202.1326	102.2421	66.3584	(83)
Total gains	510.7569	592.6375	710.4019	877.8380	1021.9293	1041.9253	981.3923	854.8861	707.2500	570.4645	498.3972	483.4058	(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	65.0973	65.2886	65.4810	66.4604	66.6598	67.6750	67.6750	67.8818	67.2653	66.6598	66.2622	65.8693	
alpha	5.3398	5.3526	5.3654	5.4307	5.4440	5.5117	5.5117	5.5255	5.4844	5.4440	5.4175	5.3913	
util living area													
	0.9968	0.9925	0.9736	0.8861	0.6913	0.4825	0.3549	0.4234	0.7243	0.9570	0.9932	0.9976	(86)
MIT	19.9291	20.0919	20.3859	20.7527	20.9472	20.9938	20.9991	20.9977	20.9522	20.6385	20.2187	19.9032	(87)
Th 2	20.1696	20.1719	20.1741	20.1853	20.1875	20.1988	20.1988	20.2010	20.1943	20.1875	20.1831	20.1786	(88)
util rest of house													
	0.9960	0.9904	0.9665	0.8600	0.6421	0.4241	0.2907	0.3510	0.6576	0.9414	0.9910	0.9970	(89)
MIT 2	18.7240	18.9627	19.3880	19.9010	20.1378	20.1945	20.1984	20.1999	20.1554	19.7607	19.1567	18.6929	(90)
Living area fraction										fLA = Living area / (4) =		0.3297	(91)
MIT	19.1213	19.3350	19.7170	20.1818	20.4046	20.4581	20.4624	20.4630	20.4181	20.0501	19.5068	19.0919	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1213	19.3350	19.7170	20.1818	20.4046	20.4581	20.4624	20.4630	20.4181	20.0501	19.5068	19.0919	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9945	0.9877	0.9617	0.8599	0.6557	0.4432	0.3119	0.3749	0.6770	0.9383	0.9886	0.9958	(94)
Useful gains	507.9317	585.3460	683.1694	754.8636	670.0946	461.7515	306.0934	320.4689	478.8344	535.2426	492.7198	481.3682	(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													
	1222.4820	1187.1261	1083.7689	911.4508	701.1401	464.7757	306.4384	321.3709	504.3283	761.1856	1005.3398	1213.9101	(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)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Space heating kWh

531.6254	404.3963	298.0461	112.7428	23.0979	0.0000	0.0000	0.0000	0.0000	168.1016	369.0864	545.0111 (98)

Space heating 2452.1076 (98)
Space heating per m2 (98) / (4) = 26.6823 (99)

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (301)
Fraction of space heat from community system 1.0000 (302)
Fraction of heat from community Heat pump 0.4600 (303a)
Fraction of heat from community Boilers 0.5400 (303b)
Fraction of total space heat from community Heat pump 0.4600 (304a)
Fraction of total space heat from community Boilers 0.5400 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating 1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating 1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system 1.0500 (306)
Space heating:
Annual space heating requirement 2452.1076 (98)
Space heat from Heat pump = (98) x 0.46 x 1.00 x 1.05 1184.3680 (307a)
Space heat from Boilers = (98) x 0.54 x 1.00 x 1.05 1390.3450 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0.0000 (308)
Space heating fuel for secondary/supplementary system 0.0000 (309)

Water heating
Annual water heating requirement 1916.0199 (64)
Water heat from Heat pump = (64) x 0.46 x 1.00 x 1.05 925.4376 (310a)
Water heat from Boilers = (64) x 0.54 x 1.00 x 1.05 1086.3833 (310b)
Electricity used for heat distribution 45.8653 (313)
Annual totals kWh/year

Electricity for pumps and fans:
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.2500, SFP = 0.6625)
mechanical ventilation fans (SFP = 0.6625) 185.6954 (330a)
Total electricity for the above, kWh/year 185.6954 (331)
Electricity for lighting (calculated in Appendix L) 381.8466 (332)

Energy saving/generation technologies (Appendices M ,N and Q)
PV Unit 0 (0.80 * 0.49 * 951 * 1.00) = -372.6415 -372.6415 (333)
Total delivered energy for all uses 4781.4345 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			370.0000	(367a)
Space heating from Heat pump	570.2177	0.5190	295.9430	(367)
Efficiency of heat source Boilers			93.9000	(367b)
Space heating from Boilers	2637.6233	0.2160	569.7266	(368)
Electrical energy for heat distribution	45.8653	0.5190	23.8041	(372)
Total CO2 associated with community systems			889.4737	(373)
(negative value allowed since DFEE <= TFEE)				
Space and water heating			889.4737	(376)
Pumps and fans	185.6954	0.5190	96.3759	(378)
Energy for lighting	381.8466	0.5190	198.1784	(379)
Energy saving/generation technologies				
PV Unit	-372.6415	0.5190	-193.4009	(380)
Total CO2, kg/year			990.6272	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			10.7800	(384)

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

DER		10.7800	ZC1
Total Floor Area	TFA	91.9000	
Assumed number of occupants	N	2.6508	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		15.6385	ZC2
CO2 emissions from cooking, equation (L16)		1.9872	ZC3
Total CO2 emissions		28.4057	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		28.4057	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	91.9000 (1b)	x	2.5000 (2b)	=	229.7500	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	91.9000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	229.7500	(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							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) =	0.1306	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3806	(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) =	0.3235	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4125	0.4044	0.3963	0.3558	0.3478	0.3073	0.3073	0.2992	0.3235	0.3478	0.3639	0.3801	(22b)
Effective ac	0.5851	0.5818	0.5785	0.5633	0.5605	0.5472	0.5472	0.5448	0.5523	0.5605	0.5662	0.5722	(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 Semi-glazed door			2.1000	1.2000	2.5200			(26a)
TER Opening Type (Uw = 1.40)			20.8700	1.3258	27.6686			(27)
External Wall 1	54.9000	20.8700	34.0300	0.1800	6.1254			(29a)
Corridor wall	7.6000	2.1000	5.5000	0.1800	0.9900			(29a)
roof	91.9000		91.9000	0.1300	11.9470			(30)
Total net area of external elements Aum(A, m2)			154.4000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	49.2510			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	4.1715	(36)
Total fabric heat loss (33) + (36) =	53.4225	(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	44.3576	44.1072	43.8617	42.7088	42.4931	41.4890	41.4890	41.3030	41.8757	42.4931	42.9295	43.3857	(38)
Heat transfer coeff	97.7801	97.5296	97.2842	96.1313	95.9156	94.9114	94.9114	94.7255	95.2982	95.9156	96.3519	96.8081	(39)
Average = Sum(39)m / 12 =												96.1302	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0640	1.0613	1.0586	1.0460	1.0437	1.0328	1.0328	1.0307	1.0370	1.0437	1.0484	1.0534	(40)
HLP (average)												1.0460	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6508 (42)
Average daily hot water use (litres/day)	97.1575 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	106.8733	102.9870	99.1007	95.2144	91.3281	87.4418	87.4418	91.3281	95.2144	99.1007	102.9870	106.8733	(44)
Energy conte	158.4900	138.6164	143.0397	124.7055	119.6579	103.2556	95.6815	109.7959	111.1073	129.4848	141.3428	153.4891	(45)
Energy content (annual)										Total = Sum(45)m =		1528.6664	(45)
Distribution loss (46)m = 0.15 x (45)m	23.7735	20.7925	21.4560	18.7058	17.9487	15.4883	14.3522	16.4694	16.6661	19.4227	21.2014	23.0234	(46)

Water storage loss:	
Store volume	2.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	0.2388 (48)
Temperature factor from Table 2b	0.5400 (49)
Enter (49) or (54) in (55)	0.1290 (55)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss
3.9977 3.6109 3.9977 3.8688 3.9977 3.8688 3.9977 3.9977 3.8688 3.9977 3.8688 3.9977 (56)
If cylinder contains dedicated solar storage
3.9977 3.6109 3.9977 3.8688 3.9977 3.8688 3.9977 3.9977 3.8688 3.9977 3.8688 3.9977 (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
185.7501 163.2384 170.2998 151.0862 146.9180 129.6364 122.9417 137.0561 137.4880 156.7449 167.7236 180.7492 (62)
Solar input 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)
Output from w/h
185.7501 163.2384 170.2998 151.0862 146.9180 129.6364 122.9417 137.0561 137.4880 156.7449 167.7236 180.7492 (64)
Total per year (kWh/year) = Sum(64)m = 1849.6326 (64)
Heat gains from water heating, kWh/month
74.5060 65.7876 69.3688 62.5692 61.5944 55.4371 53.6222 58.3153 58.0478 64.8618 68.1011 72.8432 (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	132.5422	132.5422	132.5422	132.5422	132.5422	132.5422	132.5422	132.5422	132.5422	132.5422	132.5422	132.5422	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	21.6173	19.2003	15.6148	11.8214	8.8366	7.4602	8.0611	10.4781	14.0636	17.8570	20.8418	22.2182	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	242.5301	245.0468	238.7048	225.2034	208.1603	192.1422	181.4412	178.9245	185.2665	198.7679	215.8110	231.8290	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.2542	36.2542	36.2542	36.2542	36.2542	36.2542	36.2542	36.2542	36.2542	36.2542	36.2542	36.2542	(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)													
	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	(71)
Water heating gains (Table 5)													
	100.1425	97.8982	93.2376	86.9017	82.7881	76.9960	72.0729	78.3807	80.6219	87.1799	94.5849	97.9076	(72)
Total internal gains													
	430.0526	427.9080	413.3199	389.6891	365.5477	342.3611	327.3378	333.5459	345.7147	369.5674	397.0003	417.7174	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	8.8000	11.2829	0.6300	0.7000	0.7700	30.3443	(75)
Northwest	12.0700	11.2829	0.6300	0.7000	0.7700	41.6199	(81)

Solar gains	71.9642	146.4852	263.9198	433.4322	582.6179	621.1323	581.0565	463.2250	321.5904	179.0166	90.5496	58.7696	(83)
Total gains	502.0169	574.3933	677.2397	823.1213	948.1656	963.4935	908.3943	796.7709	667.3051	548.5840	487.5499	476.4870	(84)

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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	65.2684	65.4359	65.6010	66.3878	66.5371	67.2411	67.2411	67.3731	66.9681	66.5371	66.2358	65.9236	
alpha	5.3512	5.3624	5.3734	5.4259	5.4358	5.4827	5.4827	5.4915	5.4645	5.4358	5.4157	5.3949	
util living area													
	0.9987	0.9971	0.9898	0.9498	0.8177	0.6109	0.4562	0.5377	0.8390	0.9822	0.9973	0.9991	(86)
MIT	19.8252	19.9639	20.2307	20.6027	20.8784	20.9803	20.9967	20.9923	20.8981	20.5220	20.1118	19.8034	(87)
Th 2	20.0304	20.0326	20.0348	20.0451	20.0471	20.0561	20.0561	20.0578	20.0526	20.0471	20.0432	20.0391	(88)
util rest of house													
	0.9983	0.9961	0.9862	0.9321	0.7654	0.5291	0.3602	0.4323	0.7694	0.9731	0.9962	0.9987	(89)
MIT 2	18.4536	18.6577	19.0472	19.5811	19.9328	20.0437	20.0549	20.0547	19.9703	19.4789	18.8821	18.4279	(90)
Living area fraction									fLA = Living area / (4) =			0.3297	(91)
MIT	18.9058	19.0884	19.4374	19.9179	20.2446	20.3525	20.3654	20.3638	20.2762	19.8228	19.2875	18.8814	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9058	19.0884	19.4374	19.9179	20.2446	20.3525	20.3654	20.3638	20.2762	19.8228	19.2875	18.8814	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9976	0.9947	0.9831	0.9293	0.7771	0.5555	0.3920	0.4672	0.7877	0.9703	0.9950	0.9982	(94)
Useful gains	500.8051	571.3717	665.8236	764.8955	736.8584	535.1999	356.0749	372.2644	525.6682	532.3126	485.1003	475.6150	(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													
	1428.1580	1383.7862	1258.6020	1059.1653	819.5555	545.9803	357.3803	375.4764	588.5820	884.6090	1174.2904	1421.2815	(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													
	689.9505	545.9426	441.0271	211.8743	61.5266	0.0000	0.0000	0.0000	0.0000	262.1085	496.2169	703.5758	(98)
Space heating												3412.2225	(98)
Space heating per m2											(98) / (4) =	37.1297	(99)

8c. Space cooling requirement

Not applicable

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												3649.4358	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	689.9505	545.9426	441.0271	211.8743	61.5266	0.0000	0.0000	0.0000	0.0000	262.1085	496.2169	703.5758	(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)													
	737.9150	583.8958	471.6868	226.6035	65.8039	0.0000	0.0000	0.0000	0.0000	280.3300	530.7133	752.4875	(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													
	185.7501	163.2384	170.2998	151.0862	146.9180	129.6364	122.9417	137.0561	137.4880	156.7449	167.7236	180.7492	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.9972	87.7905	87.2413	85.7158	82.6856	79.8000	79.8000	79.8000	79.8000	86.1759	87.5350	88.0859	(217)
Fuel for water heating, kWh/month													
	211.0864	185.9409	195.2055	176.2641	177.6827	162.4516	154.0622	171.7495	172.2908	181.8896	191.6075	205.1965	(219)
Water heating fuel used												2185.4273	(219)
Annual totals kWh/year													
Space heating fuel - main system												3649.4358	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												381.7691	(232)
Total delivered energy for all uses												6291.6322	(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	3649.4358	0.2160	788.2781	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2185.4273	0.2160	472.0523	(264)
Space and water heating			1260.3304	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	381.7691	0.5190	198.1382	(268)
Total CO2, kg/m2/year			1497.3936	(272)
Emissions per m2 for space and water heating			13.7142	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.1560	(272b)
Emissions per m2 for pumps and fans			0.4236	(272c)
Target Carbon Dioxide Emission Rate (TER) = (13.7142 * 1.00) + 2.1560 + 0.4236, rounded to 2 d.p.			16.2900	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	A-4-02	**Issued on Date**	05/02/2020
Assessment Reference	ASHP-1-2	**Prop Type Ref**	2bed 3F
Property			

SAP Rating	88 B	**DER**	8.46	**TER**	14.37
Environmental	93 A	**% DER<TER**	41.14		
CO_2 Emissions (t/year)	0.60	**DFEE**	33.48	**TFEE**	39.37
General Requirements Compliance	Fail	**% DFEE<TFEE**	14.97		

Assessor Details	Miss Claudia Cioli, Claudia Cioli, Tel: 07481524839, clacioli@gmail.com	**Assessor ID**	R479-0001
Client			

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

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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England
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DWELLING AS DESIGNED

Top-floor flat, total floor area 92 m²

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

1a TER and DER
Fuels for main heating:Mains gas (c), Electricity (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 14.37 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 8.46 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)39.4 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)33.5 kWh/m²/yrOK

---
2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	OK
Openings	1.38 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction

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

---
4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage Nominal cylinder loss: 0.09 kWh/day
Permitted by DBSCG 0.32 OK
Primary pipework insulated: No primary pipework

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

Hot water controls: No cylinderstat

---
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: 94%
Minimum: 70% OK

---
9 Summertime temperature
Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing South East: 16.76 m², No overhang
Air change rate: 0.50 ach
Blinds/curtains: None

---
10 Key features
Party wall U-value 0.00 W/m²K
Roof U-value 0.11 W/m²K
Thermal bridging y-value 0.039 W/m²K
Air permeability 3.0 m³/m²h
Photovoltaic array 0.49 kW

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	91.9000 (1b)	x	2.5000 (2b)	=	229.7500	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	91.9000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	229.7500	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							0 * 10 =	0.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.0000	
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	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) =	79.9000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2631	0.2599	0.2567	0.2408	0.2376	0.2216	0.2216	0.2184	0.2280	0.2376	0.2439	0.2503	(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	
W02 (Uw = 1.40)			16.7600	1.3258	22.2197			(27)
door			2.1000	1.2500	2.6250			(26a)
External Wall 1	63.4000	16.7600	46.6400	0.1500	6.9960	140.0000	6529.6000	(29a)
Corridor wall	3.5000	2.1000	1.4000	0.1409	0.1973	110.0000	154.0000	(29a)
roof	91.9000		91.9000	0.1100	10.1090	9.0000	827.1000	(30)
Total net area of external elements Aum(A, m2)			158.8000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	42.1470			(33)
Party Wall 1			52.3000	0.0000	0.0000	140.0000	7322.0000	(32)
Party Floor			91.9000			80.0000	7352.0000	(32d)
Internal Wall			163.4000			9.0000	1470.6000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	23655.3000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		257.4026 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)		6.1640 (36)
Total fabric heat loss	(33) + (36) =	48.3110 (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	19.9447	19.7031	19.4614	18.2531	18.0114	16.8031	16.8031	16.5614	17.2864	18.0114	18.4947	18.9781	(38)
Heat transfer coeff	68.2557	68.0140	67.7724	66.5640	66.3224	65.1140	65.1140	64.8724	65.5974	66.3224	66.8057	67.2890	(39)
Average = Sum(39)m / 12 =												66.5036	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7427	0.7401	0.7375	0.7243	0.7217	0.7085	0.7085	0.7059	0.7138	0.7217	0.7269	0.7322	(40)
HLP (average)												0.7237	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6508 (42)
Average daily hot water use (litres/day)	102.2711 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	112.4982	108.4074	104.3165	100.2257	96.1348	92.0440	92.0440	96.1348	100.2257	104.3165	108.4074	112.4982	(44)
Energy conte	166.8316	145.9120	150.5681	131.2689	125.9556	108.6901	100.7174	115.5747	116.9550	136.2998	148.7819	161.5675	(45)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy content (annual)												Total = Sum(45)m =	1609.1225 (45)
Distribution loss (46)m = 0.15 x (45)m													
	25.0247	21.8868	22.5852	19.6903	18.8933	16.3035	15.1076	17.3362	17.5433	20.4450	22.3173	24.2351	(46)
Water storage loss:													
Store volume													2.0000 (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													3.9149 (52)
Temperature factor from Table 2b													1.0000 (53)
Enter (49) or (54) in (55)													0.0904 (55)
Total storage loss													
	2.8029	2.5316	2.8029	2.7124	2.8029	2.7124	2.8029	2.8029	2.7124	2.8029	2.7124	2.8029	(56)
If cylinder contains dedicated solar storage													
	2.8029	2.5316	2.8029	2.7124	2.8029	2.7124	2.8029	2.8029	2.7124	2.8029	2.7124	2.8029	(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													
	192.8968	169.4548	176.6333	156.4933	152.0209	133.9146	126.7826	141.6399	142.1794	162.3650	174.0063	187.6327	(62)
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													
	192.8968	169.4548	176.6333	156.4933	152.0209	133.9146	126.7826	141.6399	142.1794	162.3650	174.0063	187.6327	(64)
											Total per year (kWh/year) = Sum(64)m =	1916.0199	(64)
Heat gains from water heating, kWh/month													
	76.3237	67.3500	70.9161	63.8265	62.7325	56.3190	54.3407	59.2808	59.0671	66.1719	69.6495	74.5734	(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	132.5422	132.5422	132.5422	132.5422	132.5422	132.5422	132.5422	132.5422	132.5422	132.5422	132.5422	132.5422	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	22.1407	19.6652	15.9928	12.1076	9.0506	7.6409	8.2562	10.7318	14.4042	18.2894	21.3464	22.7561	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	242.5301	245.0468	238.7048	225.2034	208.1603	192.1422	181.4412	178.9245	185.2665	198.7679	215.8110	231.8290	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.2542	36.2542	36.2542	36.2542	36.2542	36.2542	36.2542	36.2542	36.2542	36.2542	36.2542	36.2542	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	(71)
Water heating gains (Table 5)													
	102.5856	100.2232	95.3173	88.6479	84.3178	78.2209	73.0386	79.6785	82.0376	88.9407	96.7355	100.2331	(72)
Total internal gains													
	430.0191	427.6979	412.7776	388.7215	364.2914	340.7666	325.4987	332.0974	344.4709	368.7606	396.6555	417.5809	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	16.7600	36.7938	0.5600	0.6800	0.7700	162.7343	(77)

Solar gains	162.7343	277.1968	379.2727	469.9373	526.3690	522.5625	503.8060	461.7055	410.6722	306.3615	194.9182	139.2667	(83)
Total gains	592.7535	704.8947	792.0504	858.6589	890.6603	863.3292	829.3047	793.8029	755.1431	675.1221	591.5737	556.8476	(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	96.2691	96.6112	96.9557	98.7157	99.0754	100.9140	100.9140	101.2899	100.1704	99.0754	98.3586	97.6521	
alpha	7.4179	7.4407	7.4637	7.5810	7.6050	7.7276	7.7276	7.7527	7.6780	7.6050	7.5572	7.5101	
util living area													
	0.9962	0.9862	0.9538	0.8533	0.6789	0.4818	0.3454	0.3758	0.5946	0.8930	0.9877	0.9975	(86)
MIT	20.4086	20.5693	20.7551	20.9214	20.9869	20.9992	20.9999	20.9999	20.9961	20.9061	20.6282	20.3797	(87)
Th 2	20.3033	20.3056	20.3079	20.3194	20.3217	20.3333	20.3333	20.3356	20.3287	20.3217	20.3171	20.3125	(88)
util rest of house													
	0.9951	0.9822	0.9415	0.8231	0.6339	0.4320	0.2931	0.3216	0.5388	0.8625	0.9835	0.9967	(89)
MIT 2	19.5109	19.7448	20.0078	20.2349	20.3103	20.3328	20.3333	20.3356	20.3260	20.2228	19.8407	19.4764	(90)
Living area fraction										fLA = Living area / (4) =		0.3058	(91)
MIT	19.7854	19.9969	20.2363	20.4448	20.5172	20.5365	20.5371	20.5387	20.5309	20.4317	20.0815	19.7526	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7854	19.9969	20.2363	20.4448	20.5172	20.5365	20.5371	20.5387	20.5309	20.4317	20.0815	19.7526	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9939	0.9801	0.9401	0.8290	0.6471	0.4472	0.3091	0.3382	0.5558	0.8679	0.9817	0.9959	(94)
Useful gains	589.1594	690.8547	744.5746	711.8022	576.3635	386.1225	256.3418	268.4479	419.7056	585.9096	580.7210	554.5563	(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													
	1056.9660	1026.8034	930.9427	768.4716	584.7778	386.5521	256.3621	268.4877	421.8494	652.0627	867.2395	1046.5184	(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													
	348.0481	225.7575	138.6578	40.8020	6.2602	0.0000	0.0000	0.0000	0.0000	49.2180	206.2933	366.0198	(98)
Space heating												1381.0568	(98)
Space heating per m2											(98) / (4) =	15.0278	(99)

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)		0.0000 (301)
Fraction of space heat from community system		1.0000 (302)
Fraction of heat from community Heat pump		0.4600 (303a)
Fraction of heat from community Boilers		0.5400 (303b)
Fraction of total space heat from community Heat pump		0.4600 (304a)
Fraction of total space heat from community Boilers		0.5400 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating		1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating		1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system		1.0500 (306)
Space heating:		
Annual space heating requirement		1381.0568 (98)
Space heat from Heat pump = (98) x 0.46 x 1.00 x 1.05		667.0504 (307a)
Space heat from Boilers = (98) x 0.54 x 1.00 x 1.05		783.0592 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0.0000 (308)
Space heating fuel for secondary/supplementary system		0.0000 (309)
Water heating		
Annual water heating requirement		1916.0199 (64)
Water heat from Heat pump = (64) x 0.46 x 1.00 x 1.05		925.4376 (310a)
Water heat from Boilers = (64) x 0.54 x 1.00 x 1.05		1086.3833 (310b)
Electricity used for heat distribution		34.6193 (313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.2500, SFP = 0.6625)		
mechanical ventilation fans (SFP = 0.6625)		185.6954 (330a)
Total electricity for the above, kWh/year		185.6954 (331)
Electricity for lighting (calculated in Appendix L)		391.0125 (332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV Unit 0 (0.80 * 0.49 * 951 * 1.00) =	-372.6415	-372.6415 (333)
Total delivered energy for all uses		3665.9969 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			370.0000	(367a)
Space heating from Heat pump	430.4022	0.5190	223.3787	(367)
Efficiency of heat source Boilers			93.9000	(367b)
Space heating from Boilers	1990.8866	0.2160	430.0315	(368)
Electrical energy for heat distribution	34.6193	0.5190	17.9674	(372)
Total CO2 associated with community systems			671.3776	(373)
(negative value allowed since DFEE <= TFEE)				
Space and water heating			671.3776	(376)
Pumps and fans	185.6954	0.5190	96.3759	(378)
Energy for lighting	391.0125	0.5190	202.9355	(379)
Energy saving/generation technologies				
PV Unit	-372.6415	0.5190	-193.4009	(380)
Total CO2, kg/year			777.2881	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			8.4600	(384)

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

DER		8.4600	ZC1
Total Floor Area	TFA	91.9000	
Assumed number of occupants	N	2.6508	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		15.6385	ZC2
CO2 emissions from cooking, equation (L16)		1.9872	ZC3
Total CO2 emissions		26.0857	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		26.0857	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	91.9000 (1b)	x	2.5000 (2b)	=	229.7500	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	91.9000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	229.7500	(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							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) =	0.1306	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3806	(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) =	0.3235	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4125	0.4044	0.3963	0.3558	0.3478	0.3073	0.3073	0.2992	0.3235	0.3478	0.3639	0.3801	(22b)
Effective ac	0.5851	0.5818	0.5785	0.5633	0.5605	0.5472	0.5472	0.5448	0.5523	0.5605	0.5662	0.5722	(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 Semi-glazed door			2.1000	1.2000	2.5200			(26a)
TER Opening Type (Uw = 1.40)			16.7600	1.3258	22.2197			(27)
External Wall 1	63.4000	16.7600	46.6400	0.1800	8.3952			(29a)
Corridor wall	3.5000	2.1000	1.4000	0.1800	0.2520			(29a)
roof	91.9000		91.9000	0.1300	11.9470			(30)
Total net area of external elements Aum(A, m2)			158.8000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	45.3339			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	3.9315	(36)
Total fabric heat loss (33) + (36) =	49.2654	(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	44.3576	44.1072	43.8617	42.7088	42.4931	41.4890	41.4890	41.3030	41.8757	42.4931	42.9295	43.3857	(38)
Heat transfer coeff	93.6230	93.3726	93.1271	91.9742	91.7585	90.7544	90.7544	90.5684	91.1411	91.7585	92.1949	92.6511	(39)
Average = Sum(39)m / 12 =												91.9732	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0187	1.0160	1.0134	1.0008	0.9985	0.9875	0.9875	0.9855	0.9917	0.9985	1.0032	1.0082	(40)
HLP (average)												1.0008	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6508 (42)
Average daily hot water use (litres/day)	97.1575 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	106.8733	102.9870	99.1007	95.2144	91.3281	87.4418	87.4418	91.3281	95.2144	99.1007	102.9870	106.8733	(44)
Energy conte	158.4900	138.6164	143.0397	124.7055	119.6579	103.2556	95.6815	109.7959	111.1073	129.4848	141.3428	153.4891	(45)
Energy content (annual)										Total = Sum(45)m =		1528.6664	(45)
Distribution loss (46)m = 0.15 x (45)m	23.7735	20.7925	21.4560	18.7058	17.9487	15.4883	14.3522	16.4694	16.6661	19.4227	21.2014	23.0234	(46)

Water storage loss:	
Store volume	2.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	0.2388 (48)
Temperature factor from Table 2b	0.5400 (49)
Enter (49) or (54) in (55)	0.1290 (55)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss

	3.9977	3.6109	3.9977	3.8688	3.9977	3.8688	3.9977	3.9977	3.8688	3.9977	3.8688	3.9977 (56)

If cylinder contains dedicated solar storage

	3.9977	3.6109	3.9977	3.8688	3.9977	3.8688	3.9977	3.9977	3.8688	3.9977	3.8688	3.9977 (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

	185.7501	163.2384	170.2998	151.0862	146.9180	129.6364	122.9417	137.0561	137.4880	156.7449	167.7236	180.7492 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
								Solar input (sum of months) = Sum(63)m =				0.0000 (63)

Output from w/h

	185.7501	163.2384	170.2998	151.0862	146.9180	129.6364	122.9417	137.0561	137.4880	156.7449	167.7236	180.7492 (64)
								Total per year (kWh/year) = Sum(64)m =				1849.6326 (64)

Heat gains from water heating, kWh/month

	74.5060	65.7876	69.3688	62.5692	61.5944	55.4371	53.6222	58.3153	58.0478	64.8618	68.1011	72.8432 (65)

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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	132.5422	132.5422	132.5422	132.5422	132.5422	132.5422	132.5422	132.5422	132.5422	132.5422	132.5422	132.5422	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	22.0382	19.5741	15.9187	12.0515	9.0086	7.6055	8.2180	10.6821	14.3374	18.2047	21.2475	22.6507	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	242.5301	245.0468	238.7048	225.2034	208.1603	192.1422	181.4412	178.9245	185.2665	198.7679	215.8110	231.8290	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	36.2542	36.2542	36.2542	36.2542	36.2542	36.2542	36.2542	36.2542	36.2542	36.2542	36.2542	36.2542	(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)

	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	-106.0337	(71)

Water heating gains (Table 5)

	100.1425	97.8982	93.2376	86.9017	82.7881	76.9960	72.0729	78.3807	80.6219	87.1799	94.5849	97.9076	(72)

Total internal gains

	430.4735	428.2818	413.6239	389.9192	365.7197	342.5064	327.4947	333.7499	345.9885	369.9150	397.4060	418.1500	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	16.7600	36.7938	0.6300	0.7000	0.7700	188.4607	(77)

Solar gains	188.4607	321.0183	439.2313	544.2289	609.5817	605.1735	583.4519	534.6957	475.5946	354.7937	225.7325	161.2831	(83)
Total gains	618.9342	749.3002	852.8551	934.1481	975.3014	947.6799	910.9465	868.4456	821.5831	724.7087	623.1385	579.4331	(84)

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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	68.1664	68.3492	68.5294	69.3884	69.5515	70.3211	70.3211	70.4655	70.0227	69.5515	69.2223	68.8815	
alpha	5.5444	5.5566	5.5686	5.6259	5.6368	5.6881	5.6881	5.6977	5.6682	5.6368	5.6148	5.5921	
util living area	0.9964	0.9894	0.9700	0.9126	0.7873	0.5977	0.4361	0.4759	0.7180	0.9392	0.9910	0.9975	(86)
MIT	20.0088	20.2019	20.4518	20.7265	20.9102	20.9848	20.9978	20.9965	20.9590	20.7124	20.3028	19.9735	(87)
Th 2	20.0677	20.0700	20.0722	20.0827	20.0846	20.0937	20.0937	20.0954	20.0902	20.0846	20.0807	20.0765	(88)
util rest of house	0.9953	0.9861	0.9607	0.8868	0.7337	0.5196	0.3475	0.3844	0.6410	0.9152	0.9876	0.9967	(89)
MIT 2	18.7487	19.0305	19.3897	19.7747	20.0018	20.0842	20.0929	20.0940	20.0604	19.7660	19.1866	18.7037	(90)
Living area fraction									fLA = Living area / (4) =			0.3058	(91)
MIT	19.1340	19.3886	19.7145	20.0657	20.2795	20.3595	20.3696	20.3700	20.3352	20.0554	19.5279	19.0920	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1340	19.3886	19.7145	20.0657	20.2795	20.3595	20.3696	20.3700	20.3352	20.0554	19.5279	19.0920	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9937	0.9829	0.9562	0.8862	0.7459	0.5430	0.3747	0.4124	0.6628	0.9143	0.9848	0.9955	(94)
Useful gains	615.0299	736.4929	815.5216	827.8535	727.4292	514.6072	341.2955	358.1656	544.5672	662.6235	613.6705	576.7980	(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	1388.8008	1352.8412	1230.6254	1026.9594	787.2451	522.7042	342.1102	359.5547	568.2814	867.6103	1145.7866	1379.7583	(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	575.6856	414.1861	308.8372	143.3562	44.5030	0.0000	0.0000	0.0000	0.0000	152.5102	383.1236	597.4024	(98)
Space heating												2619.6043	(98)
Space heating per m2											(98) / (4) =	28.5049	(99)

8c. Space cooling requirement

Not applicable

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												2801.7159	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	575.6856	414.1861	308.8372	143.3562	44.5030	0.0000	0.0000	0.0000	0.0000	152.5102	383.1236	597.4024	(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)													
	615.7065	442.9798	330.3071	153.3222	47.5968	0.0000	0.0000	0.0000	0.0000	163.1125	409.7579	638.9331	(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													
	185.7501	163.2384	170.2998	151.0862	146.9180	129.6364	122.9417	137.0561	137.4880	156.7449	167.7236	180.7492	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.6335	87.1948	86.3832	84.6742	82.0555	79.8000	79.8000	79.8000	79.8000	84.7409	86.9501	87.7665	(217)
Fuel for water heating, kWh/month													
	211.9624	187.2112	197.1447	178.4325	179.0471	162.4516	154.0622	171.7495	172.2908	184.9695	192.8963	205.9434	(219)
Water heating fuel used												2198.1613	(219)
Annual totals kWh/year													
Space heating fuel - main system												2801.7159	(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)												389.2012	(232)
Total delivered energy for all uses												5464.0783	(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	2801.7159	0.2160	605.1706	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2198.1613	0.2160	474.8028	(264)
Space and water heating			1079.9735	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	389.2012	0.5190	201.9954	(268)
Total CO2, kg/m2/year			1320.8939	(272)
Emissions per m2 for space and water heating			11.7516	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.1980	(272b)
Emissions per m2 for pumps and fans			0.4236	(272c)
Target Carbon Dioxide Emission Rate (TER) = (11.7516 * 1.00) + 2.1980 + 0.4236, rounded to 2 d.p.			14.3700	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	A-4-04	**Issued on Date**	05/02/2020
Assessment Reference	ASHP-1-2	**Prop Type Ref**	2bed 3F
Property			

SAP Rating	86 B	**DER**	11.46	**TER**	19.24
Environmental	92 A	**% DER<TER**	40.44		
CO_2 Emissions (t/year)	0.50	**DFEE**	47.59	**TFEE**	53.54
General Requirements Compliance	Fail	**% DFEE<TFEE**	11.12		

Assessor Details	Miss Claudia Cioli, Claudia Cioli, Tel: 07481524839, clacioli@gmail.com	**Assessor ID**	R479-0001
Client			

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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England
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DWELLING AS DESIGNED

Top-floor flat, total floor area 57 m²

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

1a TER and DER
Fuels for main heating:Mains gas (c), Electricity (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 19.24 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 11.46 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)53.5 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)47.6 kWh/m²/yrOK

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2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	OK
Openings	1.38 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction

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

---
4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage Nominal cylinder loss: 0.09 kWh/day
Permitted by DBSCG 0.32 OK
Primary pipework insulated: No primary pipework

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

Hot water controls: No cylinderstat

---
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: 94%
Minimum: 70% OK

---
9 Summertime temperature
Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing South: 7.61 m², No overhang
Windows facing South West: 8.40 m², No overhang
Air change rate: 0.50 ach
Blinds/curtains: None

---
10 Key features
Party wall U-value 0.00 W/m²K
Roof U-value 0.11 W/m²K
Air permeability 3.0 m³/m²h
Photovoltaic array 0.49 kW

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	57.0000 (1b)	x	2.5000 (2b)	=	142.5000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	57.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	142.5000	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							0 * 10 =	0.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.0000	
Infiltration rate		0.1500	(18)
Number of sides sheltered		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

If mechanical ventilation:	0.5000	(23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	79.9000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2774	0.2739	0.2705	0.2531	0.2497	0.2323	0.2323	0.2288	0.2393	0.2497	0.2566	0.2635	(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	
W03 (Uw = 1.40)			8.4000	1.3258	11.1364			(27)
W02 (Uw = 1.40)			7.6100	1.3258	10.0890			(27)
door			2.1000	1.2500	2.6250			(26a)
External Wall 1	49.0000	16.0100	32.9900	0.1500	4.9485	140.0000	4618.6000	(29a)
Corridor wall	3.5000	2.1000	1.4000	0.1409	0.1973	110.0000	154.0000	(29a)
roof	57.0000		57.0000	0.1100	6.2700	9.0000	513.0000	(30)
Total net area of external elements Aum(A, m2)			109.5000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.2662			(33)
Party Wall 1			22.2000	0.0000	0.0000	140.0000	3108.0000	(32)
Party Floor			57.0000			80.0000	4560.0000	(32d)
Internal Wall			84.5000			9.0000	760.5000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 13714.1000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	240.5982	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	15.3980	(36)
Total fabric heat loss	(33) + (36) = 50.6642	(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	13.0450	12.8819	12.7188	11.9032	11.7401	10.9245	10.9245	10.7614	11.2507	11.7401	12.0663	12.3926	(38)
Heat transfer coeff	63.7092	63.5461	63.3829	62.5674	62.4042	61.5886	61.5886	61.4255	61.9149	62.4042	62.7305	63.0567	(39)
Average = Sum(39)m / 12 =												62.5266	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1177	1.1148	1.1120	1.0977	1.0948	1.0805	1.0805	1.0776	1.0862	1.0948	1.1005	1.1063	(40)
HLP (average)												1.0970	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.8957 (42)
Average daily hot water use (litres/day)	83.3918 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	91.7310	88.3953	85.0596	81.7240	78.3883	75.0526	75.0526	78.3883	81.7240	85.0596	88.3953	91.7310	(44)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy conte	136.0344	118.9765	122.7731	107.0366	102.7042	88.6259	82.1249	94.2395	95.3650	111.1388	121.3167	131.7420	(45)
Energy content (annual)										Total = Sum(45)m =		1312.0776	(45)
Distribution loss (46)m = 0.15 x (45)m													
	20.4052	17.8465	18.4160	16.0555	15.4056	13.2939	12.3187	14.1359	14.3048	16.6708	18.1975	19.7613	(46)
Water storage loss:													
Store volume												2.0000	(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												3.9149	(52)
Temperature factor from Table 2b												1.0000	(53)
Enter (49) or (54) in (55)												0.0904	(55)
Total storage loss													
	2.8029	2.5316	2.8029	2.7124	2.8029	2.7124	2.8029	2.8029	2.7124	2.8029	2.7124	2.8029	(56)
If cylinder contains dedicated solar storage													
	2.8029	2.5316	2.8029	2.7124	2.8029	2.7124	2.8029	2.8029	2.7124	2.8029	2.7124	2.8029	(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													
	162.0996	142.5193	148.8384	132.2610	128.7694	113.8503	108.1902	120.3048	120.5895	137.2040	146.5411	157.8073	(62)
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													
	162.0996	142.5193	148.8384	132.2610	128.7694	113.8503	108.1902	120.3048	120.5895	137.2040	146.5411	157.8073	(64)
									Total per year (kWh/year) = Sum(64)m =			1618.9750	(64)
Heat gains from water heating, kWh/month													
	66.0836	58.3939	61.6743	55.7692	55.0013	49.6477	48.1587	52.1868	51.8884	57.8058	60.5173	64.6564	(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	94.7836	94.7836	94.7836	94.7836	94.7836	94.7836	94.7836	94.7836	94.7836	94.7836	94.7836	94.7836	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	14.7386	13.0907	10.6461	8.0598	6.0248	5.0864	5.4960	7.1439	9.5885	12.1749	14.2099	15.1483	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	165.3227	167.0382	162.7151	153.5118	141.8942	130.9753	123.6809	121.9653	126.2884	135.4918	147.1093	158.0282	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	32.4784	32.4784	32.4784	32.4784	32.4784	32.4784	32.4784	32.4784	32.4784	32.4784	32.4784	32.4784	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	(71)
Water heating gains (Table 5)													
	88.8221	86.8958	82.8955	77.4572	73.9265	68.9551	64.7295	70.1436	72.0673	77.6960	84.0519	86.9038	(72)
Total internal gains													
	320.3185	318.4598	307.6918	290.4639	273.2806	256.4519	245.3414	250.6879	259.3793	276.7977	296.8061	311.5153	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	8.4000	36.7938	0.3700	0.8900	0.7700	70.5309	(79)
South	7.6100	46.7521	0.5600	0.6800	0.7700	93.8892	(78)

Solar gains	164.4201	273.9065	360.2520	425.0528	458.8224	448.4905	435.2686	410.7613	382.6003	298.6319	195.7705	141.4886	(83)
Total gains	484.7385	592.3662	667.9438	715.5167	732.1030	704.9424	680.6100	661.4493	641.9796	575.4296	492.5766	453.0040	(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	59.7947	59.9482	60.1025	60.8859	61.0451	61.8535	61.8535	62.0177	61.5276	61.0451	60.7276	60.4134	
alpha	4.9863	4.9965	5.0068	5.0591	5.0697	5.1236	5.1236	5.1345	5.1018	5.0697	5.0485	5.0276	
util living area													
	0.9891	0.9715	0.9352	0.8576	0.7258	0.5462	0.3960	0.4241	0.6351	0.8811	0.9749	0.9920	(86)
MIT	20.0014	20.2348	20.4965	20.7540	20.9159	20.9843	20.9975	20.9964	20.9665	20.7564	20.3285	19.9556	(87)
Th 2	19.9864	19.9887	19.9911	20.0027	20.0051	20.0168	20.0168	20.0191	20.0121	20.0051	20.0004	19.9957	(88)
util rest of house													
	0.9859	0.9635	0.9178	0.8224	0.6670	0.4678	0.3087	0.3353	0.5558	0.8434	0.9664	0.9895	(89)
MIT 2	18.6815	19.0171	19.3847	19.7359	19.9298	20.0071	20.0159	20.0178	19.9888	19.7497	19.1639	18.6221	(90)
Living area fraction									fLA = Living area / (4) =			0.5053	(91)
MIT	19.3484	19.6324	19.9464	20.2503	20.4280	20.5009	20.5119	20.5123	20.4828	20.2584	19.7523	19.2958	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3484	19.6324	19.9464	20.2503	20.4280	20.5009	20.5119	20.5123	20.4828	20.2584	19.7523	19.2958	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9832	0.9601	0.9169	0.8318	0.6930	0.5070	0.3529	0.3802	0.5946	0.8540	0.9639	0.9873	(94)
Useful gains	476.6084	568.7483	612.4687	595.1692	507.3281	357.4146	240.1636	251.4801	381.7093	491.4021	474.7701	447.2606	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	958.7200	936.1845	852.2754	710.1574	544.6657	363.4265	240.9259	252.5972	395.1886	602.7222	793.6857	951.8938	(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													
	358.6910	246.9171	178.4162	82.7915	27.7791	0.0000	0.0000	0.0000	0.0000	82.8222	229.6192	375.4471	(98)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Space heating		1582.4834 (98)
Space heating per m2	(98) / (4) =	27.7629 (99)

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.4600 (303a)
Fraction of heat from community Boilers	0.5400 (303b)
Fraction of total space heat from community Heat pump	0.4600 (304a)
Fraction of total space heat from community Boilers	0.5400 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	1582.4834 (98)
Space heat from Heat pump = (98) x 0.46 x 1.00 x 1.05	764.3395 (307a)
Space heat from Boilers = (98) x 0.54 x 1.00 x 1.05	897.2681 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1618.9750 (64)
Water heat from Heat pump = (64) x 0.46 x 1.00 x 1.05	781.9649 (310a)
Water heat from Boilers = (64) x 0.54 x 1.00 x 1.05	917.9588 (310b)
Electricity used for heat distribution	33.6153 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.2500, SFP = 0.6625)	
mechanical ventilation fans (SFP = 0.6625)	115.1756 (330a)
Total electricity for the above, kWh/year	115.1756 (331)
Electricity for lighting (calculated in Appendix L)	260.2889 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV Unit 0 (0.80 * 0.49 * 951 * 1.00) = -372.6415	-372.6415 (333)
Total delivered energy for all uses	3364.3544 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			370.0000	(367a)
Space heating from Heat pump	417.9201	0.5190	216.9005	(367)
Efficiency of heat source Boilers			93.9000	(367b)
Space heating from Boilers	1933.1490	0.2160	417.5602	(368)
Electrical energy for heat distribution	33.6153	0.5190	17.4463	(372)
Total CO2 associated with community systems			651.9071	(373)
(negative value allowed since DFEE <= TFEE)				
Space and water heating			651.9071	(376)
Pumps and fans	115.1756	0.5190	59.7761	(378)
Energy for lighting	260.2889	0.5190	135.0899	(379)
Energy saving/generation technologies				
PV Unit	-372.6415	0.5190	-193.4009	(380)
Total CO2, kg/year			653.3722	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			11.4600	(384)

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

DER		11.4600	ZC1
Total Floor Area	TFA	57.0000	
Assumed number of occupants	N	1.8957	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.1871	ZC2
CO2 emissions from cooking, equation (L16)		2.8859	ZC3
Total CO2 emissions		31.5330	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		31.5330	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	57.0000 (1b)	x	2.5000 (2b)	=	142.5000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	57.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	142.5000	(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)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1404	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3904	(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) =	0.3611	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4604	0.4513	0.4423	0.3972	0.3882	0.3430	0.3430	0.3340	0.3611	0.3882	0.4062	0.4243	(22b)
Effective ac	0.6060	0.6019	0.5978	0.5789	0.5753	0.5588	0.5588	0.5558	0.5652	0.5753	0.5825	0.5900	(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 Semi-glazed door			2.1000	1.2000	2.5200			(26a)
TER Opening Type (Uw = 1.40)			12.1500	1.3258	16.1080			(27)
External Wall 1	49.0000	12.1500	36.8500	0.1800	6.6330			(29a)
Corridor wall	3.5000	2.1000	1.4000	0.1800	0.2520			(29a)
roof	57.0000		57.0000	0.1300	7.4100			(30)
Total net area of external elements Aum(A, m2)			109.5000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.9230			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.7230	(36)
Total fabric heat loss					(33) + (36) =		46.6460	(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	28.4958	28.3022	28.1126	27.2217	27.0550	26.2791	26.2791	26.1354	26.5779	27.0550	27.3922	27.7447	(38)
Heat transfer coeff	75.1417	74.9482	74.7585	73.8676	73.7010	72.9250	72.9250	72.7813	73.2239	73.7010	74.0382	74.3907	(39)
Average = Sum(39)m / 12 =												73.8668	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3183	1.3149	1.3116	1.2959	1.2930	1.2794	1.2794	1.2769	1.2846	1.2930	1.2989	1.3051	(40)
HLP (average)												1.2959	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.8957	(42)
Average daily hot water use (litres/day)	79.2222	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	87.1444	83.9755	80.8066	77.6378	74.4689	71.3000	71.3000	74.4689	77.6378	80.8066	83.9755	87.1444	(44)
Energy conte	129.2327	113.0277	116.6345	101.6848	97.5689	84.1946	78.0187	89.5275	90.5968	105.5818	115.2508	125.1549	(45)
Energy content (annual)										Total = Sum(45)m =		1246.4737	(45)
Distribution loss (46)m = 0.15 x (45)m	19.3849	16.9542	17.4952	15.2527	14.6353	12.6292	11.7028	13.4291	13.5895	15.8373	17.2876	18.7732	(46)
Water storage loss:													
Store volume												2.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.2388	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.1290	(55)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss													
	3.9977	3.6109	3.9977	3.8688	3.9977	3.8688	3.9977	3.9977	3.8688	3.9977	3.8688	3.9977	(56)
If cylinder contains dedicated solar storage													
	3.9977	3.6109	3.9977	3.8688	3.9977	3.8688	3.9977	3.9977	3.8688	3.9977	3.8688	3.9977	(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													
	156.4928	137.6498	143.8946	128.0655	124.8291	110.5754	105.2788	116.7877	116.9776	132.8420	141.6316	152.4151	(62)
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													
	156.4928	137.6498	143.8946	128.0655	124.8291	110.5754	105.2788	116.7877	116.9776	132.8420	141.6316	152.4151	(64)
									Total per year (kWh/year) = Sum(64)m =			1567.4399	(64)
Heat gains from water heating, kWh/month													
	64.7780	57.2794	60.5891	54.9148	54.2498	49.0993	47.7493	51.5760	51.2281	56.9141	59.4255	63.4221	(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	94.7836	94.7836	94.7836	94.7836	94.7836	94.7836	94.7836	94.7836	94.7836	94.7836	94.7836	94.7836	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	14.7649	13.1140	10.6650	8.0741	6.0355	5.0954	5.5058	7.1566	9.6056	12.1965	14.2352	15.1752	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	165.3227	167.0382	162.7151	153.5118	141.8942	130.9753	123.6809	121.9653	126.2884	135.4918	147.1093	158.0282	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	32.4784	32.4784	32.4784	32.4784	32.4784	32.4784	32.4784	32.4784	32.4784	32.4784	32.4784	32.4784	(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)													
	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	(71)
Water heating gains (Table 5)													
	87.0672	85.2371	81.4369	76.2706	72.9164	68.1935	64.1792	69.3226	71.1501	76.4974	82.5355	85.2448	(72)
Total internal gains													
	321.5898	319.8244	309.2522	292.2915	275.2812	258.6994	247.8009	252.8797	261.4792	278.6208	298.3150	312.8833	(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	5.7800	46.7521	0.6300	0.7000	0.7700	82.5849	(78)
Southwest	6.3700	36.7938	0.6300	0.7000	0.7700	71.6286	(79)

Solar gains	154.2134	257.2627	339.2273	401.5688	434.5979	425.2856	412.5504	388.5129	360.7351	280.7297	183.6857	132.6601	(83)
Total gains	475.8032	577.0871	648.4795	693.8603	709.8791	683.9850	660.3513	641.3925	622.2143	559.3505	482.0007	445.5433	(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	52.6782	52.8143	52.9483	53.5868	53.7080	54.2795	54.2795	54.3867	54.0579	53.7080	53.4634	53.2101	
alpha	4.5119	4.5210	4.5299	4.5725	4.5805	4.6186	4.6186	4.6258	4.6039	4.5805	4.5642	4.5473	
util living area													
	0.9922	0.9811	0.9584	0.9070	0.8061	0.6404	0.4768	0.5093	0.7270	0.9229	0.9831	0.9941	(86)
MIT	19.7486	19.9755	20.2597	20.5756	20.8183	20.9538	20.9904	20.9869	20.9150	20.5981	20.1092	19.7071	(87)
Th 2	19.8265	19.8292	19.8318	19.8440	19.8463	19.8570	19.8570	19.8590	19.8529	19.8463	19.8417	19.8368	(88)
util rest of house													
	0.9896	0.9751	0.9450	0.8771	0.7460	0.5428	0.3576	0.3893	0.6361	0.8914	0.9766	0.9921	(89)
MIT 2	18.1972	18.5261	18.9320	19.3743	19.6798	19.8285	19.8538	19.8542	19.7930	19.4162	18.7312	18.1442	(90)
Living area fraction										fLA = Living area / (4) =		0.5053	(91)
MIT	18.9811	19.2584	19.6029	19.9812	20.2550	20.3971	20.4281	20.4265	20.3599	20.0134	19.4275	18.9339	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9811	19.2584	19.6029	19.9812	20.2550	20.3971	20.4281	20.4265	20.3599	20.0134	19.4275	18.9339	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9871	0.9714	0.9419	0.8811	0.7690	0.5907	0.4181	0.4502	0.6787	0.8967	0.9736	0.9900	(94)
Useful gains	469.6550	560.5607	610.7945	611.3713	545.8978	403.9982	276.1165	288.7548	422.3082	501.5682	469.2967	441.1021	(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													
	1103.1613	1076.1363	979.5502	818.5454	630.5148	422.7505	279.1622	293.0560	458.3719	693.7755	912.7043	1096.0637	(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													
	471.3286	346.4668	274.3542	149.1654	62.9550	0.0000	0.0000	0.0000	0.0000	143.0022	319.2534	487.2914	(98)
Space heating												2253.8172	(98)
Space heating per m2											(98) / (4) =	39.5407	(99)

8c. Space cooling requirement

Not applicable

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												2410.4997	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	471.3286	346.4668	274.3542	149.1654	62.9550	0.0000	0.0000	0.0000	0.0000	143.0022	319.2534	487.2914	(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)													
	504.0948	370.5528	293.4270	159.5352	67.3316	0.0000	0.0000	0.0000	0.0000	152.9435	341.4475	521.1673	(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													
	156.4928	137.6498	143.8946	128.0655	124.8291	110.5754	105.2788	116.7877	116.9776	132.8420	141.6316	152.4151	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.5731	87.1764	86.5093	85.2214	83.0936	79.8000	79.8000	79.8000	79.8000	85.0106	86.9185	87.6983	(217)
Fuel for water heating, kWh/month													
	178.6996	157.8979	166.3343	150.2740	150.2270	138.5656	131.9283	146.3505	146.5884	156.2652	162.9475	173.7948	(219)
Water heating fuel used												1859.8733	(219)
Annual totals kWh/year													
Space heating fuel - main system												2410.4997	(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)												260.7522	(232)
Total delivered energy for all uses												4606.1251	(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	2410.4997	0.2160	520.6679	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1859.8733	0.2160	401.7326	(264)
Space and water heating			922.4006	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	260.7522	0.5190	135.3304	(268)
Total CO2, kg/m2/year			1096.6559	(272)
Emissions per m2 for space and water heating			16.1825	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.3742	(272b)
Emissions per m2 for pumps and fans			0.6829	(272c)
Target Carbon Dioxide Emission Rate (TER) = (16.1825 * 1.00) + 2.3742 + 0.6829, rounded to 2 d.p.			19.2400	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	D-0-01	**Issued on Date**	05/02/2020
Assessment Reference	ASHP-1-2	**Prop Type Ref**	2bed 3F
Property			

SAP Rating	85 B	**DER**	14.15	**TER**	25.52
Environmental	92 A	**% DER<TER**	44.55		
CO_2 Emissions (t/year)	0.45	**DFEE**	61.72	**TFEE**	63.73
General Requirements Compliance	Fail	**% DFEE<TFEE**	3.16		

Assessor Details	Miss Claudia Cioli, Claudia Cioli, Tel: 07481524839, clacioli@gmail.com	**Assessor ID**	R479-0001
Client			

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

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DWELLING AS DESIGNED

Ground-floor flat, total floor area 43 m²

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

1a TER and DER
Fuels for main heating:Mains gas (c), Electricity (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 25.52 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 14.15 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)63.7 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)61.7 kWh/m²/yrOK

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2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.11 (max. 0.25)	0.11 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction

---

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

---

4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None

---

5 Cylinder insulation
Hot water storage Measured cylinder loss: 0.74 kWh/day
Permitted by DBSCG 0.32 Fail
Primary pipework insulated: No primary pipework

---

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

Hot water controls: No cylinderstat

---

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: 94%
Minimum: 70% OK

---

9 Summertime temperature
Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing West: 6.66 m², No overhang
Air change rate: 0.50 ach
Blinds/curtains: None

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10 Key features
Party wall U-value 0.00 W/m²K
Floor U-value 0.11 W/m²K
Air permeability 3.0 m³/m²h
Photovoltaic array 0.50 kW

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	43.4000 (1b)	x	2.8000 (2b)	=	121.5200	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.4000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	121.5200	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							0 * 10 =	0.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.0000	
Infiltration rate		0.1500	(18)
Number of sides sheltered		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) =	79.9000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2631	0.2599	0.2567	0.2408	0.2376	0.2216	0.2216	0.2184	0.2280	0.2376	0.2439	0.2503	(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	
W01 (Uw = 1.40)			6.6600	1.3258	8.8295			(27)
door			2.1000	1.4000	2.9400			(26a)
Heat Loss Floor 1			43.4000	0.1100	4.7740	110.0000	4774.0000	(28a)
External Wall 1	37.5000	8.7600	28.7400	0.1800	5.1732	140.0000	4023.6000	(29a)
Total net area of external elements Aum(A, m2)			80.9000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.7167			(33)
Party Wall 1			37.5000	0.0000	0.0000	140.0000	5250.0000	(32)
Party Ceilings			43.4000			80.0000	3472.0000	(32b)
Internal Wall			58.2000			9.0000	523.8000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	18043.4000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		415.7465 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)		12.2778 (36)
Total fabric heat loss	(33) + (36) =	33.9945 (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	10.5492	10.4214	10.2936	9.6545	9.5266	8.8875	8.8875	8.7597	9.1432	9.5266	9.7823	10.0379	(38)
Heat transfer coeff	44.5438	44.4159	44.2881	43.6490	43.5212	42.8821	42.8821	42.7542	43.1377	43.5212	43.7768	44.0325	(39)
Average = Sum(39)m / 12 =												43.6170	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0264	1.0234	1.0205	1.0057	1.0028	0.9881	0.9881	0.9851	0.9940	1.0028	1.0087	1.0146	(40)
HLP (average)												1.0050	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.4993 (42)
Average daily hot water use (litres/day)	73.4837 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	80.8321	77.8927	74.9534	72.0140	69.0747	66.1353	66.1353	69.0747	72.0140	74.9534	77.8927	80.8321	(44)
Energy conte	119.8716	104.8405	108.1860	94.3192	90.5015	78.0959	72.3673	83.0426	84.0344	97.9339	106.9026	116.0893	(45)
Energy content (annual)										Total = Sum(45)m =		1156.1846	(45)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m

	17.9807	15.7261	16.2279	14.1479	13.5752	11.7144	10.8551	12.4564	12.6052	14.6901	16.0354	17.4134 (46)

Water storage loss:

Store volume 2.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 0.7400 (48)

Temperature factor from Table 2b 1.0000 (49)

Enter (49) or (54) in (55) 0.7400 (55)

Total storage loss

	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400 (56)

If cylinder contains dedicated solar storage

	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400 (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

	166.0740	146.5717	154.3884	139.0312	136.7039	122.8079	118.5697	129.2450	128.7464	144.1363	151.6146	162.2917 (62)
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

	166.0740	146.5717	154.3884	139.0312	136.7039	122.8079	118.5697	129.2450	128.7464	144.1363	151.6146	162.2917 (64)

Total per year (kWh/year) = Sum(64)m = 1700.1806 (64)

Heat gains from water heating, kWh/month

	76.8192	68.2444	72.9338	67.1307	67.0537	61.7365	61.0241	64.5736	63.7110	69.5250	71.3147	75.5616 (65)

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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	74.9674	74.9674	74.9674	74.9674	74.9674	74.9674	74.9674	74.9674	74.9674	74.9674	74.9674	74.9674	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	12.4438	11.0525	8.9885	6.8049	5.0867	4.2944	4.6403	6.0316	8.0956	10.2792	11.9974	12.7897 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	130.1693	131.5200	128.1162	120.8698	111.7225	103.1254	97.3820	96.0312	99.4351	106.6815	115.8287	124.4259 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	30.4967	30.4967	30.4967	30.4967	30.4967	30.4967	30.4967	30.4967	30.4967	30.4967	30.4967	30.4967 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

	-59.9739	-59.9739	-59.9739	-59.9739	-59.9739	-59.9739	-59.9739	-59.9739	-59.9739	-59.9739	-59.9739	-59.9739 (71)

Water heating gains (Table 5)

	103.2517	101.5542	98.0292	93.2371	90.1259	85.7451	82.0216	86.7924	88.4875	93.4475	99.0482	101.5613 (72)

Total internal gains

	291.3550	289.6169	280.6241	266.4020	252.4254	238.6552	229.5341	234.3455	241.5085	255.8985	272.3645	284.2671 (73)

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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	6.6600	19.6403	0.3700	0.6400	0.7700	21.4653	(80)

Solar gains	21.4653	41.9906	69.1526	100.8549	123.6015	126.5281	120.4599	103.4733	80.4273	49.8254	26.7647	17.6520	(83)
Total gains	312.8203	331.6076	349.7767	367.2569	376.0269	365.1833	349.9940	337.8188	321.9358	305.7239	299.1292	301.9191	(84)

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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	112.5198	112.8436	113.1693	114.8263	115.1636	116.8800	116.8800	117.2294	116.1873	115.1636	114.4911	113.8263	
alpha	8.5013	8.5229	8.5446	8.6551	8.6776	8.7920	8.7920	8.8153	8.7458	8.6776	8.6327	8.5884	
util living area	0.9996	0.9992	0.9975	0.9865	0.9265	0.7354	0.5380	0.5801	0.8588	0.9890	0.9989	0.9997	(86)
MIT	20.3786	20.4468	20.5770	20.7604	20.9185	20.9915	20.9994	20.9990	20.9694	20.7828	20.5527	20.3680	(87)
Th 2	20.0614	20.0639	20.0663	20.0786	20.0810	20.0933	20.0933	20.0958	20.0884	20.0810	20.0761	20.0712	(88)
util rest of house	0.9994	0.9988	0.9959	0.9774	0.8825	0.6401	0.4279	0.4674	0.7762	0.9797	0.9981	0.9996	(89)
MIT 2	19.2394	19.3411	19.5330	19.8056	20.0113	20.0895	20.0932	20.0955	20.0705	19.8416	19.5061	19.2319	(90)

Living area fraction fLA = Living area / (4) = 0.8249 (91)

MIT	20.1791	20.2532	20.3942	20.5932	20.7597	20.8335	20.8407	20.8408	20.8120	20.6180	20.3694	20.1691	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1791	20.2532	20.3942	20.5932	20.7597	20.8335	20.8407	20.8408	20.8120	20.6180	20.3694	20.1691	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9995	0.9989	0.9965	0.9830	0.9166	0.7187	0.5188	0.5605	0.8438	0.9858	0.9984	0.9996	(94)
Useful gains	312.6505	331.2418	348.5617	361.0314	344.6698	262.4665	181.5752	189.3427	271.6537	301.3862	298.6571	301.7980	(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	707.3168	681.9252	615.3484	510.3958	394.2875	267.3060	181.8520	189.8620	289.5394	435.9952	580.8943	703.1580	(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	293.6317	235.6592	198.4893	107.5424	36.9155	0.0000	0.0000	0.0000	0.0000	100.1491	203.2108	298.6119	(98)

Space heating 1474.2098 (98)

Space heating per m2 (98) / (4) = 33.9680 (99)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)		0.0000 (301)
Fraction of space heat from community system		1.0000 (302)
Fraction of heat from community Heat pump		0.4600 (303a)
Fraction of heat from community Boilers		0.5400 (303b)
Fraction of total space heat from community Heat pump		0.4600 (304a)
Fraction of total space heat from community Boilers		0.5400 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating		1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating		1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system		1.0500 (306)
Space heating:		
Annual space heating requirement		1474.2098 (98)
Space heat from Heat pump = (98) x 0.46 x 1.00 x 1.05		712.0434 (307a)
Space heat from Boilers = (98) x 0.54 x 1.00 x 1.05		835.8770 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0.0000 (308)
Space heating fuel for secondary/supplementary system		0.0000 (309)
Water heating		
Annual water heating requirement		1700.1806 (64)
Water heat from Heat pump = (64) x 0.46 x 1.00 x 1.05		821.1872 (310a)
Water heat from Boilers = (64) x 0.54 x 1.00 x 1.05		964.0024 (310b)
Electricity used for heat distribution		33.3311 (313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.2500, SFP = 0.6625)		
mechanical ventilation fans (SFP = 0.6625)		98.2185 (330a)
Total electricity for the above, kWh/year		98.2185 (331)
Electricity for lighting (calculated in Appendix L)		219.7622 (332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV Unit 0 (0.80 * 0.50 * 951 * 1.00) =	-380.2464	-380.2464 (333)
Total delivered energy for all uses		3270.8443 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			370.0000	(367a)
Space heating from Heat pump	414.3866	0.5190	215.0667	(367)
Efficiency of heat source Boilers			93.9000	(367b)
Space heating from Boilers	1916.8044	0.2160	414.0298	(368)
Electrical energy for heat distribution	33.3311	0.5190	17.2988	(372)
Total CO2 associated with community systems			646.3953	(373)
(negative value allowed since DFEE <= TFEE)				
Space and water heating			646.3953	(376)
Pumps and fans	98.2185	0.5190	50.9754	(378)
Energy for lighting	219.7622	0.5190	114.0566	(379)
Energy saving/generation technologies				
PV Unit	-380.2464	0.5190	-197.3479	(380)
Total CO2, kg/year			614.0794	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			14.1500	(384)

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

DER		14.1500	ZC1
Total Floor Area	TFA	43.4000	
Assumed number of occupants	N	1.4993	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.7732	ZC2
CO2 emissions from cooking, equation (L16)		3.5711	ZC3
Total CO2 emissions		35.4942	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		35.4942	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	43.4000 (1b)	x	2.8000 (2b)	=	121.5200	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.4000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	121.5200	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							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) =	0.1646	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.4146	(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) =	0.3524	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4493	0.4405	0.4317	0.3876	0.3788	0.3348	0.3348	0.3260	0.3524	0.3788	0.3964	0.4141	(22b)
Effective ac	0.6009	0.5970	0.5932	0.5751	0.5718	0.5560	0.5560	0.5531	0.5621	0.5718	0.5786	0.5857	(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 Semi-glazed door			2.1000	1.2000	2.5200			(26a)
TER Opening Type (Uw = 1.40)			6.6600	1.3258	8.8295			(27)
Heat Loss Floor 1			43.4000	0.1300	5.6420			(28a)
External Wall 1	37.5000	8.7600	28.7400	0.1800	5.1732			(29a)
Total net area of external elements Aum(A, m2)			80.9000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		22.1647			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.1950	(36)
Total fabric heat loss					(33) + (36) =		32.3597	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	24.0985	23.9413	23.7873	23.0636	22.9282	22.2980	22.2980	22.1813	22.5407	22.9282	23.2021	23.4885	(38)
Heat transfer coeff	56.4583	56.3011	56.1470	55.4234	55.2880	54.6577	54.6577	54.5410	54.9005	55.2880	55.5619	55.8482	(39)
Average = Sum(39)m / 12 =												55.4227	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3009	1.2973	1.2937	1.2770	1.2739	1.2594	1.2594	1.2567	1.2650	1.2739	1.2802	1.2868	(40)
HLP (average)												1.2770	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.4993	(42)
Average daily hot water use (litres/day)	69.8095	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	76.7905	73.9981	71.2057	68.4133	65.6209	62.8286	62.8286	65.6209	68.4133	71.2057	73.9981	76.7905	(44)
Energy conte	113.8780	99.5985	102.7767	89.6032	85.9764	74.1911	68.7490	78.8904	79.8326	93.0372	101.5574	110.2848	(45)
Energy content (annual)										Total = Sum(45)m =		1098.3754	(45)
Distribution loss (46)m = 0.15 x (45)m	17.0817	14.9398	15.4165	13.4405	12.8965	11.1287	10.3123	11.8336	11.9749	13.9556	15.2336	16.5427	(46)
Water storage loss:													
Store volume												2.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.2388	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.1290	(55)
Total storage loss													

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

	3.9977	3.6109	3.9977	3.8688	3.9977	3.8688	3.9977	3.9977	3.8688	3.9977	3.8688	3.9977	(56)
If cylinder contains dedicated solar storage													
	3.9977	3.6109	3.9977	3.8688	3.9977	3.8688	3.9977	3.9977	3.8688	3.9977	3.8688	3.9977	(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													
	141.1382	124.2205	130.0368	115.9840	113.2365	100.5719	96.0091	106.1506	106.2134	120.2974	127.9382	137.5449	(62)
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													
	141.1382	124.2205	130.0368	115.9840	113.2365	100.5719	96.0091	106.1506	106.2134	120.2974	127.9382	137.5449	(64)
								Total per year (kWh/year) = Sum(64)m =				1419.3416	(64)
Heat gains from water heating, kWh/month													
	59.6726	52.8141	55.9814	50.8977	50.3953	45.7732	44.6671	48.0392	47.6490	52.7430	54.8725	58.4778	(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	74.9674	74.9674	74.9674	74.9674	74.9674	74.9674	74.9674	74.9674	74.9674	74.9674	74.9674	74.9674	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	12.2094	10.8442	8.8191	6.6767	4.9909	4.2135	4.5528	5.9180	7.9431	10.0856	11.7713	12.5487	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	130.1693	131.5200	128.1162	120.8698	111.7225	103.1254	97.3820	96.0312	99.4351	106.6815	115.8287	124.4259	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	30.4967	30.4967	30.4967	30.4967	30.4967	30.4967	30.4967	30.4967	30.4967	30.4967	30.4967	30.4967	(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)													
	-59.9739	-59.9739	-59.9739	-59.9739	-59.9739	-59.9739	-59.9739	-59.9739	-59.9739	-59.9739	-59.9739	-59.9739	(71)
Water heating gains (Table 5)													
	80.2051	78.5925	75.2438	70.6912	67.7356	63.5738	60.0365	64.5688	66.1791	70.8911	76.2118	78.5992	(72)
Total internal gains													
	271.0739	269.4470	260.6693	246.7279	232.9392	219.4030	210.4615	215.0082	222.0475	236.1484	252.3020	264.0640	(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	6.6600	19.6403	0.6300	0.7000	0.7700	39.9755	(80)
Solar gains	39.9755	78.2005	128.7850	187.8253	230.1869	235.6373	224.3363	192.7016	149.7823	92.7914	49.8447	32.8739	(83)
Total gains	311.0494	347.6474	389.4543	434.5532	463.1261	455.0402	434.7978	407.7098	371.8298	328.9398	302.1467	296.9378	(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	53.3826	53.5316	53.6785	54.3794	54.5125	55.1411	55.1411	55.2591	54.8973	54.5125	54.2438	53.9657	
alpha	4.5588	4.5688	4.5786	4.6253	4.6342	4.6761	4.6761	4.6839	4.6598	4.6342	4.6163	4.5977	
util living area	0.9957	0.9922	0.9819	0.9482	0.8626	0.7017	0.5371	0.5894	0.8309	0.9664	0.9920	0.9965	(86)
MIT	19.6666	19.8167	20.0896	20.4531	20.7573	20.9353	20.9852	20.9775	20.8519	20.4559	20.0010	19.6438	(87)
Th 2	20.3496	20.3514	20.3531	20.3615	20.3630	20.3703	20.3703	20.3716	20.3675	20.3630	20.3599	20.3566	(88)
util rest of house	0.9950	0.9909	0.9785	0.9381	0.8361	0.6493	0.4663	0.5181	0.7900	0.9581	0.9903	0.9959	(89)
MIT 2	19.0930	19.2440	19.5165	19.8802	20.1688	20.3280	20.3632	20.3602	20.2608	19.8877	19.4350	19.0759	(90)
Living area fraction										fLA = Living area / (4) =		0.8249	(91)
MIT	19.5661	19.7164	19.9892	20.3527	20.6543	20.8289	20.8763	20.8694	20.7484	20.3564	19.9019	19.5444	(92)
Temperature adjustment												0.6000	
adjusted MIT	20.1661	20.3164	20.5892	20.9527	21.2543	21.4289	21.4763	21.4694	21.3484	20.9564	20.5019	20.1444	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9947	0.9908	0.9798	0.9475	0.8720	0.7338	0.5873	0.6384	0.8501	0.9659	0.9907	0.9957	(94)
Useful gains	309.4102	344.4402	381.5951	411.7367	403.8454	333.9136	255.3712	260.2768	316.0745	317.7187	299.3373	295.6657	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	895.7736	867.9593	791.0680	668.0040	528.2371	373.2542	266.5255	276.4903	397.9407	572.5845	744.6353	890.4638	(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	436.2544	351.8048	304.6478	184.5125	92.5474	0.0000	0.0000	0.0000	0.0000	189.6202	320.6146	442.5298	(98)
Space heating												2322.5314	(98)
Space heating per m2											(98) / (4) =	53.5145	(99)

8c. Space cooling requirement

Not applicable

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 %)												88.5000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												2624.3293	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	436.2544	351.8048	304.6478	184.5125	92.5474	0.0000	0.0000	0.0000	0.0000	189.6202	320.6146	442.5298	(98)
Space heating efficiency (main heating system 1)													
	88.5000	88.5000	88.5000	88.5000	88.5000	0.0000	0.0000	0.0000	0.0000	88.5000	88.5000	88.5000	(210)
Space heating fuel (main heating system)													
	492.9428	397.5196	344.2348	208.4887	104.5734	0.0000	0.0000	0.0000	0.0000	214.2601	362.2764	500.0336	(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													
	141.1382	124.2205	130.0368	115.9840	113.2365	100.5719	96.0091	106.1506	106.2134	120.2974	127.9382	137.5449	(64)
Efficiency of water heater												74.8000	(216)
(217)m	82.6113	82.4232	81.9913	81.0263	79.2610	74.8000	74.8000	74.8000	74.8000	81.0023	82.1483	82.6951	(217)
Fuel for water heating, kWh/month													
	170.8460	150.7106	158.5983	143.1436	142.8654	134.4544	128.3544	141.9125	141.9966	148.5111	155.7406	166.3279	(219)
Water heating fuel used												1783.4613	(219)
Annual totals kWh/year													
Space heating fuel - main system												2624.3293	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												39.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												84.0000	(231)
Electricity for lighting (calculated in Appendix L)												215.6211	(232)
Total delivered energy for all uses												4707.4117	(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	2624.3293	0.2160	566.8551	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1783.4613	0.2160	385.2276	(264)
Space and water heating			952.0828	(265)
Pumps and fans	84.0000	0.5190	43.5960	(267)
Energy for lighting	215.6211	0.5190	111.9073	(268)
Total CO2, kg/m2/year			1107.5861	(272)
Emissions per m2 for space and water heating			21.9374	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.5785	(272b)
Emissions per m2 for pumps and fans			1.0045	(272c)
Target Carbon Dioxide Emission Rate (TER) = (21.9374 * 1.00) + 2.5785 + 1.0045, rounded to 2 d.p.			25.5200	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	D-1/2-01	**Issued on Date**	05/02/2020
Assessment Reference	ASHP-1-2	**Prop Type Ref**	2bed 3F
Property			

SAP Rating	86 B	**DER**	12.20	**TER**	19.24
Environmental	93 A	**% DER<TER**	36.59		
CO_2 Emissions (t/year)	0.46	**DFEE**	50.37	**TFEE**	50.38
General Requirements Compliance	Fail	**% DFEE<TFEE**	0.02		

Assessor Details	Miss Claudia Cioli, Claudia Cioli, Tel: 07481524839, clacioli@gmail.com	**Assessor ID**	R479-0001
Client			

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

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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England
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DWELLING AS DESIGNED

Mid-floor flat, total floor area 50 m²

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

1a TER and DER
Fuels for main heating:Mains gas (c), Electricity (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 19.24 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 12.20 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)50.4 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)50.4 kWh/m²/yrOK

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2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction

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

---
4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage Measured cylinder loss: 0.74 kWh/day
Permitted by DBSCG 0.32 Fail
Primary pipework insulated: No primary pipework

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

Hot water controls: No cylinderstat

---
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: 94%
Minimum: 70% OK

---
9 Summertime temperature
Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing East: 7.32 m², Overhang width less than twice window, ratio 1.00
Windows facing West: 6.66 m², No overhang
Air change rate: 0.50 ach
Blinds/curtains: None

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10 Key features
Party wall U-value 0.00 W/m²K
Air permeability 3.0 m³/m²h
Photovoltaic array 0.50 kW

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	49.5000 (1b)	x	2.5500 (2b)	=	126.2250	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.5000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	126.2250	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							0 * 10 =	0.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.0000	
Infiltration rate		0.1500	(18)
Number of sides sheltered		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

If mechanical ventilation:	0.5000	(23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	79.9000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2774	0.2739	0.2705	0.2531	0.2497	0.2323	0.2323	0.2288	0.2393	0.2497	0.2566	0.2635	(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	
W29 (Uw = 1.40)			7.3200	1.3258	9.7045			(27)
W02 (Uw = 1.40)			6.6600	1.3258	8.8295			(27)
door			2.1000	1.4000	2.9400			(26a)
External Wall 1	55.6000	13.9800	41.6200	0.1800	7.4916	140.0000	5826.8000	(29a)
stair wall	22.2000	2.1000	20.1000	0.1800	3.6180	140.0000	2814.0000	(29a)
Total net area of external elements Aum(A, m2)			77.8000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.5837			(33)
Party Wall 1			5.1000	0.0000	0.0000	140.0000	714.0000	(32)
Party Floor 1			49.5000			80.0000	3960.0000	(32d)
Party Ceilings			49.5000			80.0000	3960.0000	(32b)
Internal Wall			64.4000			9.0000	579.6000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 17854.4000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	360.6949	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	7.5945	(36)
Total fabric heat loss	(33) + (36) = 40.1782	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	11.5551	11.4107	11.2662	10.5437	10.3992	9.6768	9.6768	9.5323	9.9658	10.3992	10.6882	10.9772	(38)
Heat transfer coeff	51.7333	51.5889	51.4444	50.7219	50.5774	49.8550	49.8550	49.7105	50.1440	50.5774	50.8664	51.1554	(39)
Average = Sum(39)m / 12 =												50.6858	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0451	1.0422	1.0393	1.0247	1.0218	1.0072	1.0072	1.0043	1.0130	1.0218	1.0276	1.0334	(40)
HLP (average)												1.0240	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.6754 (42)
Average daily hot water use (litres/day)	77.8847 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	85.6732	82.5578	79.4424	76.3270	73.2117	70.0963	70.0963	73.2117	76.3270	79.4424	82.5578	85.6732	(44)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy conte	127.0509	111.1195	114.6654	99.9681	95.9218	82.7732	76.7015	88.0161	89.0673	103.7994	113.3051	123.0420	(45)
Energy content (annual)										Total = Sum(45)m =		1225.4303	(45)
Distribution loss (46)m = 0.15 x (45)m													
	19.0576	16.6679	17.1998	14.9952	14.3883	12.4160	11.5052	13.2024	13.3601	15.5699	16.9958	18.4563	(46)
Water storage loss:													
Store volume												2.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.7400	(48)
Temperature factor from Table 2b												1.0000	(49)
Enter (49) or (54) in (55)												0.7400	(55)
Total storage loss													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(56)
If cylinder contains dedicated solar storage													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(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													
	173.2533	152.8507	160.8678	144.6801	142.1242	127.4852	122.9039	134.2185	133.7793	150.0018	158.0171	169.2444	(62)
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													
	173.2533	152.8507	160.8678	144.6801	142.1242	127.4852	122.9039	134.2185	133.7793	150.0018	158.0171	169.2444	(64)
									Total per year (kWh/year) = Sum(64)m =			1769.4263	(64)
Heat gains from water heating, kWh/month													
	79.2063	70.3322	75.0882	69.0090	68.8559	63.2917	62.4652	66.2273	65.3845	71.4752	73.4436	77.8734	(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	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	13.0102	11.5556	9.3976	7.1146	5.3183	4.4899	4.8515	6.3062	8.4641	10.7471	12.5435	13.3718	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	145.9354	147.4497	143.6336	135.5095	125.2544	115.6159	109.1769	107.6625	111.4787	119.6027	129.8579	139.4963	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	(71)
Water heating gains (Table 5)													
	106.4601	104.6610	100.9250	95.8458	92.5483	87.9051	83.9586	89.0152	90.8118	96.0688	102.0049	104.6685	(72)
Total internal gains													
	313.5366	311.7972	302.0870	286.6008	271.2517	256.1418	246.1178	251.1147	258.8854	274.5495	292.5372	305.6675	(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	7.3200	19.6403	0.3700	0.8900	0.7700	32.8083	(76)
West	6.6600	19.6403	0.5600	0.6800	0.7700	34.5185	(80)

Solar gains	67.3268	131.7054	216.9001	316.3358	387.6814	396.8609	377.8278	324.5485	252.2638	156.2796	83.9486	55.3662	(83)
Total gains	380.8634	443.5026	518.9871	602.9366	658.9331	653.0027	623.9456	575.6632	511.1491	430.8291	376.4857	361.0338	(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	95.8677	96.1362	96.4062	97.7793	98.0587	99.4796	99.4796	99.7688	98.9063	98.0587	97.5016	96.9508	
alpha	7.3912	7.4091	7.4271	7.5186	7.5372	7.6320	7.6320	7.6513	7.5938	7.5372	7.5001	7.4634	
util living area													
	0.9987	0.9955	0.9784	0.8903	0.6968	0.4876	0.3515	0.3970	0.6652	0.9509	0.9958	0.9991	(86)
MIT	20.3106	20.4451	20.6602	20.8900	20.9839	20.9990	20.9999	20.9998	20.9914	20.8336	20.5254	20.2879	(87)
Th 2	20.0459	20.0483	20.0507	20.0628	20.0652	20.0774	20.0774	20.0798	20.0725	20.0652	20.0604	20.0556	(88)
util rest of house													
	0.9981	0.9934	0.9689	0.8531	0.6337	0.4179	0.2778	0.3177	0.5817	0.9238	0.9935	0.9987	(89)
MIT 2	19.1388	19.3363	19.6448	19.9542	20.0537	20.0769	20.0773	20.0798	20.0680	19.8962	19.4635	19.1134	(90)
Living area fraction									fLA = Living area / (4) =			0.4747	(91)
MIT	19.6951	19.8627	20.1268	20.3985	20.4953	20.5147	20.5153	20.5166	20.5064	20.3412	19.9676	19.6710	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6951	19.8627	20.1268	20.3985	20.4953	20.5147	20.5153	20.5166	20.5064	20.3412	19.9676	19.6710	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9978	0.9929	0.9698	0.8674	0.6633	0.4510	0.3128	0.3554	0.6215	0.9330	0.9932	0.9984	(94)
Useful gains	380.0100	440.3640	503.2946	523.0011	437.0954	294.5016	195.1804	204.5879	317.6676	401.9722	373.9359	360.4720	(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													
	796.4409	771.9092	701.0245	583.2252	444.8455	294.8766	195.1993	204.6361	321.2415	492.6859	654.5303	791.4247	(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													
	309.8246	222.7984	147.1111	43.3613	5.7661	0.0000	0.0000	0.0000	0.0000	67.4910	202.0280	320.6288	(98)
Space heating												1319.0091	(98)
Space heating per m2											(98) / (4) =	26.6466	(99)

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)		0.0000 (301)
Fraction of space heat from community system		1.0000 (302)
Fraction of heat from community Heat pump		0.4600 (303a)
Fraction of heat from community Boilers		0.5400 (303b)
Fraction of total space heat from community Heat pump		0.4600 (304a)
Fraction of total space heat from community Boilers		0.5400 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating		1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating		1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system		1.0500 (306)
Space heating:		
Annual space heating requirement		1319.0091 (98)
Space heat from Heat pump = (98) x 0.46 x 1.00 x 1.05		637.0814 (307a)
Space heat from Boilers = (98) x 0.54 x 1.00 x 1.05		747.8782 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0.0000 (308)
Space heating fuel for secondary/supplementary system		0.0000 (309)
Water heating		
Annual water heating requirement		1769.4263 (64)
Water heat from Heat pump = (64) x 0.46 x 1.00 x 1.05		854.6329 (310a)
Water heat from Boilers = (64) x 0.54 x 1.00 x 1.05		1003.2647 (310b)
Electricity used for heat distribution		32.4286 (313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.2500, SFP = 0.6625)		
mechanical ventilation fans (SFP = 0.6625)		102.0214 (330a)
Total electricity for the above, kWh/year		102.0214 (331)
Electricity for lighting (calculated in Appendix L)		229.7650 (332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV Unit 0 (0.80 * 0.50 * 951 * 1.00) =	-380.2464	-380.2464 (333)
Total delivered energy for all uses		3194.3971 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			370.0000	(367a)
Space heating from Heat pump	403.1660	0.5190	209.2432	(367)
Efficiency of heat source Boilers			93.9000	(367b)
Space heating from Boilers	1864.9019	0.2160	402.8188	(368)
Electrical energy for heat distribution	32.4286	0.5190	16.8304	(372)
Total CO2 associated with community systems			628.8924	(373)
(negative value allowed since DFEE <= TFEE)				
Space and water heating			628.8924	(376)
Pumps and fans	102.0214	0.5190	52.9491	(378)
Energy for lighting	229.7650	0.5190	119.2480	(379)
Energy saving/generation technologies				
PV Unit	-380.2464	0.5190	-197.3479	(380)
Total CO2, kg/year			603.7416	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			12.2000	(384)

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

DER		12.2000	ZC1
Total Floor Area	TFA	49.5000	
Assumed number of occupants	N	1.6754	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.4704	ZC2
CO2 emissions from cooking, equation (L16)		3.2164	ZC3
Total CO2 emissions		32.8867	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		32.8867	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	49.5000 (1b)	x	2.5500 (2b)	=	126.2250	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.5000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	126.2250	(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)

			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000	/ (5) =	0.1584	(8)
Pressure test			Yes	
Measured/design AP50			5.0000	
Infiltration rate			0.4084	(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) =		0.3778	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4817	0.4723	0.4628	0.4156	0.4061	0.3589	0.3589	0.3495	0.3778	0.4061	0.4250	0.4439	(22b)
Effective ac	0.6160	0.6115	0.6071	0.5864	0.5825	0.5644	0.5644	0.5611	0.5714	0.5825	0.5903	0.5985	(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 Semi-glazed door			2.1000	1.2000	2.5200			(26a)
TER Opening Type (Uw = 1.40)			10.2700	1.3258	13.6155			(27)
External Wall 1	55.6000	10.2700	45.3300	0.1800	8.1594			(29a)
stair wall	22.2000	2.1000	20.1000	0.1800	3.6180			(29a)
Total net area of external elements Aum(A, m2)			77.8000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.9129			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	4.3455	(36)
Total fabric heat loss (33) + (36) =	32.2584	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	25.6600	25.4723	25.2884	24.4244	24.2627	23.5102	23.5102	23.3708	23.8001	24.2627	24.5897	24.9316	(38)
Heat transfer coeff	57.9184	57.7308	57.5468	56.6828	56.5211	55.7686	55.7686	55.6293	56.0585	56.5211	56.8482	57.1901	(39)
Average = Sum(39)m / 12 =												56.6820	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1701	1.1663	1.1626	1.1451	1.1418	1.1266	1.1266	1.1238	1.1325	1.1418	1.1484	1.1554	(40)
HLP (average)												1.1451	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.6754 (42)
Average daily hot water use (litres/day)	73.9905 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	81.3896	78.4299	75.4703	72.5107	69.5511	66.5915	66.5915	69.5511	72.5107	75.4703	78.4299	81.3896	(44)
Energy conte	120.6984	105.5636	108.9321	94.9697	91.1257	78.6345	72.8664	83.6153	84.6139	98.6094	107.6399	116.8899	(45)
Energy content (annual)										Total = Sum(45)m =		1164.1588	(45)
Distribution loss (46)m = 0.15 x (45)m	18.1048	15.8345	16.3398	14.2455	13.6688	11.7952	10.9300	12.5423	12.6921	14.7914	16.1460	17.5335	(46)

Water storage loss:	
Store volume	2.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	0.2388 (48)
Temperature factor from Table 2b	0.5400 (49)
Enter (49) or (54) in (55)	0.1290 (55)
Total storage loss	

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

	3.9977	3.6109	3.9977	3.8688	3.9977	3.8688	3.9977	3.9977	3.8688	3.9977	3.8688	3.9977	(56)
If cylinder contains dedicated solar storage													
	3.9977	3.6109	3.9977	3.8688	3.9977	3.8688	3.9977	3.9977	3.8688	3.9977	3.8688	3.9977	(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													
	147.9585	130.1856	136.1923	121.3505	118.3858	105.0153	100.1266	110.8755	110.9947	125.8695	134.0206	144.1501	(62)
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													
	147.9585	130.1856	136.1923	121.3505	118.3858	105.0153	100.1266	110.8755	110.9947	125.8695	134.0206	144.1501	(64)
								Total per year (kWh/year) = Sum(64)m =				1485.1250	(64)
Heat gains from water heating, kWh/month													
	61.9403	54.7975	58.0280	52.6820	52.1074	47.2506	46.0362	49.6102	49.2388	54.5957	56.8949	60.6740	(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	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	13.0577	11.5978	9.4319	7.1406	5.3377	4.5063	4.8692	6.3292	8.4950	10.7863	12.5893	13.4206	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	145.9354	147.4497	143.6336	135.5095	125.2544	115.6159	109.1769	107.6625	111.4787	119.6027	129.8579	139.4963	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	(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)													
	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	(71)
Water heating gains (Table 5)													
	83.2531	81.5440	77.9947	73.1695	70.0368	65.6258	61.8766	66.6804	68.3872	73.3814	79.0207	81.5511	(72)
Total internal gains													
	293.3771	291.7223	282.1911	266.9505	251.7597	236.8789	227.0536	231.8029	239.4917	254.9013	272.5987	285.5989	(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	5.3800	19.6403	0.6300	0.7000	0.7700	32.2925	(76)
West	4.8900	19.6403	0.6300	0.7000	0.7700	29.3513	(80)

Solar gains	61.6438	120.5884	198.5919	289.6345	354.9579	363.3626	345.9360	297.1539	230.9706	143.0883	76.8626	50.6929	(83)
Total gains	355.0209	412.3107	480.7830	556.5849	606.7176	600.2415	572.9896	528.9568	470.4623	397.9896	349.4613	336.2918	(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	59.3507	59.5436	59.7340	60.6445	60.8179	61.6386	61.6386	61.7930	61.3199	60.8179	60.4681	60.1066	
alpha	4.9567	4.9696	4.9823	5.0430	5.0545	5.1092	5.1092	5.1195	5.0880	5.0545	5.0312	5.0071	
util living area													
	0.9956	0.9901	0.9718	0.9083	0.7698	0.5770	0.4250	0.4776	0.7447	0.9503	0.9907	0.9966	(86)
MIT	19.8397	20.0140	20.3049	20.6576	20.8886	20.9798	20.9965	20.9938	20.9306	20.6017	20.1574	19.8141	(87)
Th 2	19.9440	19.9471	19.9501	19.9642	19.9668	19.9791	19.9791	19.9814	19.9744	19.9668	19.9615	19.9559	(88)
util rest of house													
	0.9941	0.9869	0.9625	0.8801	0.7106	0.4924	0.3281	0.3751	0.6614	0.9286	0.9871	0.9955	(89)
MIT 2	18.4125	18.6677	19.0871	19.5822	19.8663	19.9669	19.9779	19.9791	19.9238	19.5220	18.8880	18.3837	(90)
Living area fraction									fLA = Living area / (4) =			0.4747	(91)
MIT	19.0901	19.3068	19.6652	20.0928	20.3517	20.4477	20.4615	20.4608	20.4017	20.0346	19.4907	19.0628	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0901	19.3068	19.6652	20.0928	20.3517	20.4477	20.4615	20.4608	20.4017	20.0346	19.4907	19.0628	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9925	0.9843	0.9594	0.8840	0.7339	0.5321	0.3743	0.4239	0.6981	0.9303	0.9850	0.9942	(94)
Useful gains	352.3662	405.8536	461.2712	492.0255	445.2601	319.3615	214.4415	224.2304	328.4427	370.2658	344.2066	334.3271	(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													
	856.6178	831.7178	757.6175	634.4370	489.0012	326.1207	215.3495	225.9004	353.2663	533.2545	704.3860	850.0047	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	375.1631	286.1807	220.4816	102.5363	32.5434	0.0000	0.0000	0.0000	0.0000	121.2635	259.3292	383.6641	(98)
Space heating												1781.1621	(98)
Space heating per m2											(98) / (4) =	35.9831	(99)

8c. Space cooling requirement

Not applicable

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												1904.9862	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	375.1631	286.1807	220.4816	102.5363	32.5434	0.0000	0.0000	0.0000	0.0000	121.2635	259.3292	383.6641	(98)
Space heating efficiency (main heating system 1)													
	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)													
	401.2440	306.0757	235.8092	109.6645	34.8058	0.0000	0.0000	0.0000	0.0000	129.6936	277.3574	410.3359	(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													
	147.9585	130.1856	136.1923	121.3505	118.3858	105.0153	100.1266	110.8755	110.9947	125.8695	134.0206	144.1501	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.1933	86.8585	86.0922	84.3684	81.8876	79.8000	79.8000	79.8000	79.8000	84.7147	86.5461	87.3030	(217)
Fuel for water heating, kWh/month													
	169.6903	149.8824	158.1936	143.8340	144.5711	131.5981	125.4719	138.9417	139.0911	148.5806	154.8546	165.1147	(219)
Water heating fuel used												1769.8242	(219)
Annual totals kWh/year													
Space heating fuel - main system												1904.9862	(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)												230.6035	(232)
Total delivered energy for all uses												3980.4138	(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	1904.9862	0.2160	411.4770	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1769.8242	0.2160	382.2820	(264)
Space and water heating			793.7590	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	230.6035	0.5190	119.6832	(268)
Total CO2, kg/m2/year			952.3672	(272)
Emissions per m2 for space and water heating			16.0355	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.4178	(272b)
Emissions per m2 for pumps and fans			0.7864	(272c)
Target Carbon Dioxide Emission Rate (TER) = (16.0355 * 1.00) + 2.4178 + 0.7864, rounded to 2 d.p.			19.2400	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	D-1/2-02	**Issued on Date**	05/02/2020
Assessment Reference	ASHP-1-2	**Prop Type Ref**	2bed 3F
Property			

SAP Rating	86 B	**DER**	10.54	**TER**	17.51
Environmental	93 A	**% DER<TER**	39.80		
CO_2 Emissions (t/year)	0.42	**DFEE**	40.68	**TFEE**	42.07
General Requirements Compliance	Fail	**% DFEE<TFEE**	3.29		

Assessor Details	Miss Claudia Cioli, Claudia Cioli, Tel: 07481524839, clacioli@gmail.com	**Assessor ID**	R479-0001
Client			

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DWELLING AS DESIGNED

Top-floor flat, total floor area 51 m²

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

1a TER and DER
Fuels for main heating:Mains gas (c), Electricity (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 17.51 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 10.54 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)42.1 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)40.7 kWh/m²/yrOK

---
2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction

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

---
4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage Measured cylinder loss: 0.74 kWh/day
Permitted by DBSCG 0.32 Fail
Primary pipework insulated: No primary pipework

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

Hot water controls: No cylinderstat

---
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: 94%
Minimum: 70% OK

---
9 Summertime temperature
Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing East: 3.33 m², No overhang
Windows facing South: 12.19 m², No overhang
Air change rate: 0.50 ach
Blinds/curtains: None

---
10 Key features
Party wall U-value 0.00 W/m²K
Air permeability 3.0 m³/m²h
Photovoltaic array 0.50 kW

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	51.4000 (1b)	x	2.5500 (2b)	=	131.0700	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.4000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	131.0700	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							0 * 10 =	0.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.0000	
Infiltration rate		0.1500	(18)
Number of sides sheltered		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

If mechanical ventilation:	0.5000	(23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	79.9000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2774	0.2739	0.2705	0.2531	0.2497	0.2323	0.2323	0.2288	0.2393	0.2497	0.2566	0.2635	(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	
W03 (Uw = 1.40)			8.3900	1.3258	11.1231			(27)
W02 (Uw = 1.40)			7.1300	1.3258	9.4527			(27)
door			2.1000	1.4000	2.9400			(26a)
External Wall 1	57.1000	15.5200	41.5800	0.1800	7.4844	140.0000	5821.2000	(29a)
stair wall	13.5000	2.1000	11.4000	0.1800	2.0520	140.0000	1596.0000	(29a)
Total net area of external elements Aum(A, m2)			70.6000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		33.0522			(33)
Party Wall 1			8.4000	0.0000	0.0000	140.0000	1176.0000	(32)
Party Floor 1			51.4000			80.0000	4112.0000	(32d)
Party Ceilings 1			51.4000			80.0000	4112.0000	(32b)
Internal Wall			95.0000			9.0000	855.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 17672.2000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	343.8171	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	7.1785	(36)
Total fabric heat loss	(33) + (36) = 40.2307	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	11.9987	11.8486	11.6986	10.9484	10.7984	10.0482	10.0482	9.8982	10.3483	10.7984	11.0985	11.3985	(38)
Heat transfer coeff	52.2293	52.0793	51.9293	51.1791	51.0291	50.2789	50.2789	50.1289	50.5790	51.0291	51.3291	51.6292	(39)
Average = Sum(39)m / 12 =												51.1416	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0161	1.0132	1.0103	0.9957	0.9928	0.9782	0.9782	0.9753	0.9840	0.9928	0.9986	1.0045	(40)
HLP (average)												0.9950	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.7314 (42)
Average daily hot water use (litres/day)	79.2842 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	87.2127	84.0413	80.8699	77.6986	74.5272	71.3558	71.3558	74.5272	77.6986	80.8699	84.0413	87.2127	(44)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy conte	129.3339	113.1162	116.7258	101.7644	97.6454	84.2605	78.0798	89.5977	90.6677	105.6645	115.3411	125.2529	(45)
Energy content (annual)										Total = Sum(45)m =		1247.4498	(45)
Distribution loss (46)m = 0.15 x (45)m													
	19.4001	16.9674	17.5089	15.2647	14.6468	12.6391	11.7120	13.4396	13.6002	15.8497	17.3012	18.7879	(46)
Water storage loss:													
Store volume												2.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.7400	(48)
Temperature factor from Table 2b												1.0000	(49)
Enter (49) or (54) in (55)												0.7400	(55)
Total storage loss													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(56)
If cylinder contains dedicated solar storage													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(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													
	175.5363	154.8474	162.9282	146.4764	143.8478	128.9725	124.2822	135.8001	135.3797	151.8669	160.0531	171.4553	(62)
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													
	175.5363	154.8474	162.9282	146.4764	143.8478	128.9725	124.2822	135.8001	135.3797	151.8669	160.0531	171.4553	(64)
								Total per year (kWh/year) = Sum(64)m =				1791.4458	(64)
Heat gains from water heating, kWh/month													
	79.9654	70.9961	75.7733	69.6063	69.4290	63.7862	62.9234	66.7531	65.9166	72.0954	74.1205	78.6085	(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	86.5685	86.5685	86.5685	86.5685	86.5685	86.5685	86.5685	86.5685	86.5685	86.5685	86.5685	86.5685	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	13.4501	11.9463	9.7153	7.3551	5.4981	4.6417	5.0155	6.5193	8.7503	11.1105	12.9675	13.8239	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	150.8691	152.4347	148.4896	140.0908	129.4890	119.5247	112.8679	111.3024	115.2475	123.6462	134.2481	144.2124	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.6568	31.6568	31.6568	31.6568	31.6568	31.6568	31.6568	31.6568	31.6568	31.6568	31.6568	31.6568	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-69.2548	-69.2548	-69.2548	-69.2548	-69.2548	-69.2548	-69.2548	-69.2548	-69.2548	-69.2548	-69.2548	-69.2548	(71)
Water heating gains (Table 5)													
	107.4804	105.6490	101.8458	96.6754	93.3185	88.5920	84.5745	89.7220	91.5509	96.9024	102.9451	105.6566	(72)
Total internal gains													
	320.7702	319.0005	309.0212	293.0919	277.2761	261.7289	251.4285	256.5142	264.5192	280.6296	299.1314	312.6635	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	8.3900	46.7521	0.3700	0.8900	0.7700	89.5133	(78)
East	3.3300	19.6403	0.5600	0.6800	0.7700	17.2592	(76)
South	3.8000	46.7521	0.5600	0.6800	0.7700	46.8829	(78)

Solar gains	153.6555	257.1446	340.1513	402.6949	434.5115	424.2517	411.9743	389.2214	361.9129	281.0007	183.1963	132.0521	(83)
Total gains	474.4257	576.1451	649.1726	695.7867	711.7876	685.9806	663.4028	645.7356	626.4320	561.6303	482.3277	444.7155	(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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	93.9883	94.2590	94.5314	95.9170	96.1990	97.6343	97.6343	97.9265	97.0551	96.1990	95.6366	95.0808	
alpha	7.2659	7.2839	7.3021	7.3945	7.4133	7.5090	7.5090	7.5284	7.4703	7.4133	7.3758	7.3387	
util living area													
	0.9945	0.9787	0.9341	0.8237	0.6553	0.4682	0.3334	0.3570	0.5540	0.8547	0.9812	0.9964	(86)
MIT	20.4250	20.6055	20.7893	20.9336	20.9883	20.9992	20.9999	20.9999	20.9972	20.9270	20.6542	20.3897	(87)
Th 2	20.0699	20.0723	20.0748	20.0869	20.0894	20.1015	20.1015	20.1040	20.0967	20.0894	20.0845	20.0796	(88)
util rest of house													
	0.9922	0.9707	0.9125	0.7801	0.5958	0.4030	0.2654	0.2875	0.4831	0.8067	0.9727	0.9948	(89)
MIT 2	19.3276	19.5865	19.8379	20.0241	20.0809	20.1012	20.1015	20.1040	20.0952	20.0235	19.6684	19.2844	(90)
Living area fraction										fLA = Living area / (4) =		0.4339	(91)
MIT	19.8037	20.0286	20.2506	20.4187	20.4746	20.4908	20.4913	20.4927	20.4865	20.4155	20.0961	19.7639	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8037	20.0286	20.2506	20.4187	20.4746	20.4908	20.4913	20.4927	20.4865	20.4155	20.0961	19.7639	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9914	0.9703	0.9171	0.7967	0.6214	0.4313	0.2949	0.3177	0.5139	0.8251	0.9729	0.9941	(94)
Useful gains	470.3374	559.0242	595.3440	554.3276	442.3035	295.8738	195.6365	205.1361	321.9084	463.3746	469.2449	442.1121	(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													
	809.7466	787.8858	714.0609	589.5149	447.7598	296.1811	195.6509	205.1611	323.0233	500.8760	667.0788	803.5525	(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													
	252.5205	153.7950	88.3254	25.3349	4.0595	0.0000	0.0000	0.0000	0.0000	27.9010	142.4404	268.9117	(98)
Space heating												963.2883	(98)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Space heating per m2		(98) / (4) =	18.7410 (99)

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)			0.0000 (301)
Fraction of space heat from community system			1.0000 (302)
Fraction of heat from community Heat pump			0.4600 (303a)
Fraction of heat from community Boilers			0.5400 (303b)
Fraction of total space heat from community Heat pump			0.4600 (304a)
Fraction of total space heat from community Boilers			0.5400 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating			1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating			1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system			1.0500 (306)
Space heating:			
Annual space heating requirement			963.2883 (98)
Space heat from Heat pump = (98) x 0.46 x 1.00 x 1.05			465.2682 (307a)
Space heat from Boilers = (98) x 0.54 x 1.00 x 1.05			546.1845 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)			0.0000 (308)
Space heating fuel for secondary/supplementary system			0.0000 (309)
Water heating			
Annual water heating requirement			1791.4458 (64)
Water heat from Heat pump = (64) x 0.46 x 1.00 x 1.05			865.2683 (310a)
Water heat from Boilers = (64) x 0.54 x 1.00 x 1.05			1015.7498 (310b)
Electricity used for heat distribution			28.9247 (313)
Annual totals kWh/year			
Electricity for pumps and fans:			
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.2500, SFP = 0.6625)			
mechanical ventilation fans (SFP = 0.6625)			105.9373 (330a)
Total electricity for the above, kWh/year			105.9373 (331)
Electricity for lighting (calculated in Appendix L)			237.5329 (332)
Energy saving/generation technologies (Appendices M ,N and Q)			
PV Unit 0 (0.80 * 0.50 * 951 * 1.00) =		-380.2464	-380.2464 (333)
Total delivered energy for all uses			2855.6946 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			370.0000	(367a)
Space heating from Heat pump	359.6045	0.5190	186.6347	(367)
Efficiency of heat source Boilers			93.9000	(367b)
Space heating from Boilers	1663.4017	0.2160	359.2948	(368)
Electrical energy for heat distribution	28.9247	0.5190	15.0119	(372)
Total CO2 associated with community systems			560.9414	(373)
(negative value allowed since DFEE <= TFEE)				
Space and water heating			560.9414	(376)
Pumps and fans	105.9373	0.5190	54.9815	(378)
Energy for lighting	237.5329	0.5190	123.2796	(379)
Energy saving/generation technologies				
PV Unit	-380.2464	0.5190	-197.3479	(380)
Total CO2, kg/year			541.8546	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			10.5400	(384)

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

DER		10.5400	ZC1
Total Floor Area	TFA	51.4000	
Assumed number of occupants	N	1.7314	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.3934	ZC2
CO2 emissions from cooking, equation (L16)		3.1236	ZC3
Total CO2 emissions		31.0570	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		31.0570	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	51.4000 (1b)	x	2.5500 (2b)	=	131.0700	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.4000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	131.0700	(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)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1526	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.4026	(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) =	0.3724	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4748	0.4655	0.4562	0.4096	0.4003	0.3538	0.3538	0.3445	0.3724	0.4003	0.4189	0.4376	(22b)
Effective ac	0.6127	0.6083	0.6041	0.5839	0.5801	0.5626	0.5626	0.5593	0.5693	0.5801	0.5878	0.5957	(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 Semi-glazed door			2.1000	1.2000	2.5200			(26a)
TER Opening Type (Uw = 1.40)			10.7500	1.3258	14.2519			(27)
External Wall 1	57.1000	10.7500	46.3500	0.1800	8.3430			(29a)
stair wall	13.5000	2.1000	11.4000	0.1800	2.0520			(29a)
Total net area of external elements Aum(A, m2)			70.6000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.1669			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	5.2610	(36)
Total fabric heat loss (33) + (36) =	32.4279	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.5020	26.3127	26.1271	25.2555	25.0924	24.3333	24.3333	24.1927	24.6257	25.0924	25.4223	25.7672	(38)
Heat transfer coeff	58.9299	58.7406	58.5550	57.6834	57.5203	56.7612	56.7612	56.6206	57.0536	57.5203	57.8502	58.1951	(39)
Average = Sum(39)m / 12 =												57.6826	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1465	1.1428	1.1392	1.1222	1.1191	1.1043	1.1043	1.1016	1.1100	1.1191	1.1255	1.1322	(40)
HLP (average)												1.1222	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.7314 (42)
Average daily hot water use (litres/day)	75.3200 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	82.8520	79.8392	76.8264	73.8136	70.8008	67.7880	67.7880	70.8008	73.8136	76.8264	79.8392	82.8520	(44)
Energy conte	122.8672	107.4604	110.8895	96.6762	92.7631	80.0475	74.1758	85.1178	86.1344	100.3813	109.5740	118.9903	(45)
Energy content (annual)										Total = Sum(45)m =		1185.0773	(45)
Distribution loss (46)m = 0.15 x (45)m	18.4301	16.1191	16.6334	14.5014	13.9145	12.0071	11.1264	12.7677	12.9202	15.0572	16.4361	17.8485	(46)

Water storage loss:	
Store volume	2.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	0.2388 (48)
Temperature factor from Table 2b	0.5400 (49)
Enter (49) or (54) in (55)	0.1290 (55)
Total storage loss	

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

	3.9977	3.6109	3.9977	3.8688	3.9977	3.8688	3.9977	3.9977	3.8688	3.9977	3.8688	3.9977	(56)
If cylinder contains dedicated solar storage													
	3.9977	3.6109	3.9977	3.8688	3.9977	3.8688	3.9977	3.9977	3.8688	3.9977	3.8688	3.9977	(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													
	150.1273	132.0825	138.1497	123.0570	120.0232	106.4283	101.4359	112.3779	112.5151	127.6414	135.9548	146.2504	(62)
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													
	150.1273	132.0825	138.1497	123.0570	120.0232	106.4283	101.4359	112.3779	112.5151	127.6414	135.9548	146.2504	(64)
								Total per year (kWh/year) = Sum(64)m =				1506.0435	(64)
Heat gains from water heating, kWh/month													
	62.6614	55.4282	58.6789	53.2495	52.6518	47.7204	46.4716	50.1098	49.7443	55.1849	57.5380	61.3724	(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	86.5685	86.5685	86.5685	86.5685	86.5685	86.5685	86.5685	86.5685	86.5685	86.5685	86.5685	86.5685	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	13.4909	11.9825	9.7448	7.3775	5.5147	4.6558	5.0307	6.5391	8.7768	11.1442	13.0069	13.8659	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	150.8691	152.4347	148.4896	140.0908	129.4890	119.5247	112.8679	111.3024	115.2475	123.6462	134.2481	144.2124	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.6568	31.6568	31.6568	31.6568	31.6568	31.6568	31.6568	31.6568	31.6568	31.6568	31.6568	31.6568	(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)													
	-69.2548	-69.2548	-69.2548	-69.2548	-69.2548	-69.2548	-69.2548	-69.2548	-69.2548	-69.2548	-69.2548	-69.2548	(71)
Water heating gains (Table 5)													
	84.2224	82.4825	78.8695	73.9576	70.7686	66.2784	62.4618	67.3518	69.0893	74.1732	79.9139	82.4898	(72)
Total internal gains													
	300.5530	298.8703	289.0744	273.3964	257.7429	242.4294	232.3310	237.1639	245.0842	260.9342	279.1395	292.5386	(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	2.3100	19.6403	0.6300	0.7000	0.7700	13.8654	(76)
South	8.4400	46.7521	0.6300	0.7000	0.7700	120.5910	(78)

Solar gains	134.4564	224.6206	296.2449	349.4824	376.1350	366.8741	356.4134	337.4001	314.7526	245.2035	160.2300	115.6040	(83)
Total gains	435.0094	523.4909	585.3193	622.8788	633.8779	609.3035	588.7444	574.5640	559.8368	506.1378	439.3695	408.1426	(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	60.5710	60.7662	60.9588	61.8799	62.0554	62.8853	62.8853	63.0415	62.5630	62.0554	61.7015	61.3358	
alpha	5.0381	5.0511	5.0639	5.1253	5.1370	5.1924	5.1924	5.2028	5.1709	5.1370	5.1134	5.0891	
util living area													
	0.9908	0.9768	0.9472	0.8804	0.7588	0.5791	0.4213	0.4492	0.6651	0.8983	0.9788	0.9931	(86)
MIT	19.9887	20.2053	20.4606	20.7253	20.9008	20.9808	20.9969	20.9957	20.9607	20.7362	20.3135	19.9508	(87)
Th 2	19.9630	19.9660	19.9689	19.9827	19.9853	19.9973	19.9973	19.9996	19.9927	19.9853	19.9801	19.9746	(88)
util rest of house													
	0.9879	0.9699	0.9319	0.8474	0.6997	0.4957	0.3269	0.3537	0.5826	0.8628	0.9713	0.9910	(89)
MIT 2	18.6422	18.9552	19.3167	19.6829	19.8963	19.9856	19.9963	19.9979	19.9656	19.7077	19.1243	18.5958	(90)
Living area fraction									fLA = Living area / (4) =			0.4339	(91)
MIT	19.2264	19.4976	19.8130	20.1352	20.3321	20.4174	20.4304	20.4308	20.3973	20.1539	19.6402	19.1837	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2264	19.4976	19.8130	20.1352	20.3321	20.4174	20.4304	20.4308	20.3973	20.1539	19.6402	19.1837	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9852	0.9661	0.9292	0.8529	0.7210	0.5314	0.3680	0.3952	0.6170	0.8695	0.9682	0.9887	(94)
Useful gains	428.5853	505.7321	543.8524	531.2384	457.0122	323.7709	216.6380	227.0951	345.3966	440.0616	425.3786	403.5386	(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													
	879.6094	857.4694	779.5446	648.0835	496.5225	330.1998	217.4172	228.2269	359.2853	549.5448	725.4556	871.9781	(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													
	335.5619	236.3675	175.3550	84.1285	29.3956	0.0000	0.0000	0.0000	0.0000	81.4555	216.0554	348.5190	(98)
Space heating												1506.8384	(98)
Space heating per m2											(98) / (4) =	29.3159	(99)

8c. Space cooling requirement

Not applicable

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												1611.5919	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	335.5619	236.3675	175.3550	84.1285	29.3956	0.0000	0.0000	0.0000	0.0000	81.4555	216.0554	348.5190	(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)													
	358.8897	252.7994	187.5455	89.9770	31.4392	0.0000	0.0000	0.0000	0.0000	87.1182	231.0753	372.7476	(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													
	150.1273	132.0825	138.1497	123.0570	120.0232	106.4283	101.4359	112.3779	112.5151	127.6414	135.9548	146.2504	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.8984	86.3494	85.4510	83.8243	81.7004	79.8000	79.8000	79.8000	79.8000	83.6529	86.0440	87.0498	(217)
Fuel for water heating, kWh/month													
	172.7619	152.9628	161.6712	146.8035	146.9066	133.3688	127.1127	140.8245	140.9964	152.5846	158.0061	168.0078	(219)
Water heating fuel used												1802.0065	(219)
Annual totals kWh/year													
Space heating fuel - main system												1611.5919	(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)												238.2541	(232)
Total delivered energy for all uses												3726.8525	(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	1611.5919	0.2160	348.1038	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1802.0065	0.2160	389.2334	(264)
Space and water heating			737.3373	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	238.2541	0.5190	123.6539	(268)
Total CO2, kg/m2/year			899.9161	(272)
Emissions per m2 for space and water heating			14.3451	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.4057	(272b)
Emissions per m2 for pumps and fans			0.7573	(272c)
Target Carbon Dioxide Emission Rate (TER) = (14.3451 * 1.00) + 2.4057 + 0.7573, rounded to 2 d.p.			17.5100	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	D-3-01	**Issued on Date**	08/01/2020
Assessment Reference	ASHP - Be lean	**Prop Type Ref**	2bed 3F
Property			

SAP Rating	79 C	**DER**	24.79	**TER**	23.68
Environmental	84 B	**% DER<TER**	-4.69		
CO_2 Emissions (t/year)	1.03	**DFEE**	69.97	**TFEE**	73.17
General Requirements Compliance	Fail	**% DFEE<TFEE**	4.38		

Assessor Details	Miss Claudia Cioli, Claudia Cioli, Tel: 07481524839, clacioli@gmail.com	**Assessor ID**	R479-0001
Client			

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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England
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DWELLING AS DESIGNED

Mid-floor flat, total floor area 50 m²

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

1a TER and DER
Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 23.68 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 24.79 kgCO□/m²Fail
Excess emissions =1.11 kgCO□/m² (4.7%)

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)73.2 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)70.0 kWh/m²/yrOK
---
2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	OK
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction
---
3 Air permeability
Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK
---
4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None
---
5 Cylinder insulation
Hot water storage Measured cylinder loss: 0.74 kWh/day
Permitted by DBSCG 0.32 Fail
Primary pipework insulated: No primary pipework
---
6 Controls
Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinderstat

---
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: 94%
Minimum: 70% OK
---
9 Summertime temperature
Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing East: 7.32 m², Overhang width less than twice window, ratio 1.00
Windows facing West: 6.66 m², No overhang
Air change rate: 0.50 ach
Blinds/curtains: None
---
10 Key features
Party wall U-value 0.00 W/m²K
Air permeability 3.0 m³/m²h

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	49.5000 (1b)	x	2.5500 (2b)	=	126.2250	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.5000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	126.2250	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							0 * 10 =	0.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.0000	
Infiltration rate		0.1500	(18)
Number of sides sheltered		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

If mechanical ventilation:	0.5000	(23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	79.9000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2774	0.2739	0.2705	0.2531	0.2497	0.2323	0.2323	0.2288	0.2393	0.2497	0.2566	0.2635	(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	
W29 (Uw = 1.40)			7.3200	1.3258	9.7045			(27)
W02 (Uw = 1.40)			6.6600	1.3258	8.8295			(27)
door			2.1000	1.4000	2.9400			(26a)
External Wall 1	55.6000	13.9800	41.6200	0.1800	7.4916	140.0000	5826.8000	(29a)
stair wall	22.2000	2.1000	20.1000	0.1800	3.6180	140.0000	2814.0000	(29a)
External Roof 1	49.5000		49.5000	0.1300	6.4350	9.0000	445.5000	(30)
Total net area of external elements Aum(A, m2)			127.3000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.0187			(33)
Party Wall 1			5.1000	0.0000	0.0000	140.0000	714.0000	(32)
Party Floor 1			49.5000			80.0000	3960.0000	(32d)
Internal Wall			64.4000			9.0000	579.6000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	14339.9000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		289.6949 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)		18.7175 (36)
Total fabric heat loss	(33) + (36) =	57.7362 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	11.5551	11.4107	11.2662	10.5437	10.3992	9.6768	9.6768	9.5323	9.9658	10.3992	10.6882	10.9772	(38)
Heat transfer coeff	69.2913	69.1469	69.0024	68.2799	68.1354	67.4130	67.4130	67.2685	67.7020	68.1354	68.4244	68.7134	(39)
Average = Sum(39)m / 12 =												68.2438	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3998	1.3969	1.3940	1.3794	1.3765	1.3619	1.3619	1.3590	1.3677	1.3765	1.3823	1.3881	(40)
HLP (average)												1.3787	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.6754 (42)
Average daily hot water use (litres/day)	77.8847 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	85.6732	82.5578	79.4424	76.3270	73.2117	70.0963	70.0963	73.2117	76.3270	79.4424	82.5578	85.6732	(44)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy conte	127.0509	111.1195	114.6654	99.9681	95.9218	82.7732	76.7015	88.0161	89.0673	103.7994	113.3051	123.0420	(45)
Energy content (annual)										Total = Sum(45)m =		1225.4303	(45)
Distribution loss (46)m = 0.15 x (45)m													
	19.0576	16.6679	17.1998	14.9952	14.3883	12.4160	11.5052	13.2024	13.3601	15.5699	16.9958	18.4563	(46)
Water storage loss:													
Store volume												2.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.7400	(48)
Temperature factor from Table 2b												1.0000	(49)
Enter (49) or (54) in (55)												0.7400	(55)
Total storage loss													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(56)
If cylinder contains dedicated solar storage													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(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													
	173.2533	152.8507	160.8678	144.6801	142.1242	127.4852	122.9039	134.2185	133.7793	150.0018	158.0171	169.2444	(62)
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													
	173.2533	152.8507	160.8678	144.6801	142.1242	127.4852	122.9039	134.2185	133.7793	150.0018	158.0171	169.2444	(64)
									Total per year (kWh/year) = Sum(64)m =			1769.4263	(64)
Heat gains from water heating, kWh/month													
	79.2063	70.3322	75.0882	69.0090	68.8559	63.2917	62.4652	66.2273	65.3845	71.4752	73.4436	77.8734	(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	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	13.0102	11.5556	9.3976	7.1146	5.3183	4.4899	4.8515	6.3062	8.4641	10.7471	12.5435	13.3718	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	145.9354	147.4497	143.6336	135.5095	125.2544	115.6159	109.1769	107.6625	111.4787	119.6027	129.8579	139.4963	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	(71)
Water heating gains (Table 5)													
	106.4601	104.6610	100.9250	95.8458	92.5483	87.9051	83.9586	89.0152	90.8118	96.0688	102.0049	104.6685	(72)
Total internal gains													
	313.5366	311.7972	302.0870	286.6008	271.2517	256.1418	246.1178	251.1147	258.8854	274.5495	292.5372	305.6675	(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	7.3200	19.6403	0.3700	0.8900	0.7700	32.8083	(76)
West	6.6600	19.6403	0.5600	0.6800	0.7700	34.5185	(80)

Solar gains	67.3268	131.7054	216.9001	316.3358	387.6814	396.8609	377.8278	324.5485	252.2638	156.2796	83.9486	55.3662	(83)
Total gains	380.8634	443.5026	518.9871	602.9366	658.9331	653.0027	623.9456	575.6632	511.1491	430.8291	376.4857	361.0338	(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	57.4863	57.6065	57.7271	58.3379	58.4616	59.0881	59.0881	59.2150	58.8359	58.4616	58.2147	57.9699	
alpha	4.8324	4.8404	4.8485	4.8892	4.8974	4.9392	4.9392	4.9477	4.9224	4.8974	4.8810	4.8647	
util living area													
	0.9969	0.9930	0.9796	0.9313	0.8138	0.6291	0.4690	0.5257	0.7917	0.9638	0.9934	0.9976	(86)
MIT	19.7403	19.9093	20.2019	20.5698	20.8416	20.9663	20.9935	20.9889	20.8983	20.5229	20.0624	19.7109	(87)
Th 2	19.7635	19.7657	19.7679	19.7792	19.7814	19.7927	19.7927	19.7949	19.7882	19.7814	19.7769	19.7724	(88)
util rest of house													
	0.9956	0.9902	0.9713	0.9040	0.7484	0.5243	0.3438	0.3942	0.6967	0.9436	0.9903	0.9966	(89)
MIT 2	18.1207	18.3679	18.7908	19.3084	19.6445	19.7744	19.7909	19.7915	19.7191	19.2598	18.6001	18.0840	(90)
Living area fraction									fLA = Living area / (4) =			0.4747	(91)
MIT	18.8896	19.0997	19.4607	19.9073	20.2128	20.3403	20.3618	20.3600	20.2789	19.8595	19.2943	18.8564	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8896	19.0997	19.4607	19.9073	20.2128	20.3403	20.3618	20.3600	20.2789	19.8595	19.2943	18.8564	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9944	0.9882	0.9687	0.9074	0.7735	0.5735	0.4036	0.4572	0.7386	0.9453	0.9886	0.9956	(94)
Useful gains	378.7343	438.2615	502.7463	547.0783	509.6774	374.5182	251.8246	263.1880	377.5536	407.2436	372.1979	359.4543	(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													
	1010.9322	981.8646	894.3196	751.5743	580.0223	386.9684	253.5965	266.3821	418.3223	630.8968	834.3898	1007.0878	(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													
	470.3552	365.3013	291.3306	147.2371	52.3366	0.0000	0.0000	0.0000	0.0000	166.3979	332.7782	481.8393	(98)
Space heating												2307.5762	(98)
Space heating per m2											(98) / (4) =	46.6177	(99)

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Boilers	1.0000	(303a)
Fraction of total space heat from community Boilers	1.0000	(304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.1000	(306)
Space heating:		
Annual space heating requirement	2307.5762	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.10	2538.3338	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	1769.4263	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.10	1946.3689	(310a)
Electricity used for heat distribution	44.8470	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.2500, SFP = 0.6625)		
mechanical ventilation fans (SFP = 0.6625)	102.0214	(330a)
Total electricity for the above, kWh/year	102.0214	(331)
Electricity for lighting (calculated in Appendix L)	229.7650	(332)
Total delivered energy for all uses	4816.4891	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Boilers			93.9000	(367a)
Space heating from Boilers	4776.0412	0.2160	1031.6249	(367)
Electrical energy for heat distribution	44.8470	0.5190	23.2756	(372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			1054.9005	(373)
Space and water heating			1054.9005	(376)
Pumps and fans	102.0214	0.5190	52.9491	(378)
Energy for lighting	229.7650	0.5190	119.2480	(379)
Total CO2, kg/year			1227.0976	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			24.7900	(384)

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

DER		24.7900	ZC1
Total Floor Area	TFA	49.5000	
Assumed number of occupants	N	1.6754	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.4704	ZC2
CO2 emissions from cooking, equation (L16)		3.2164	ZC3
Total CO2 emissions		45.4767	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		45.4767	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	49.5000 (1b)	x	2.5500 (2b)	=	126.2250	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.5000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	126.2250	(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)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1584	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.4084	(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) =	0.3778	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4817	0.4723	0.4628	0.4156	0.4061	0.3589	0.3589	0.3495	0.3778	0.4061	0.4250	0.4439	(22b)
Effective ac	0.6160	0.6115	0.6071	0.5864	0.5825	0.5644	0.5644	0.5611	0.5714	0.5825	0.5903	0.5985	(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 Semi-glazed door			2.1000	1.2000	2.5200			(26a)
TER Opening Type (Uw = 1.40)			10.2700	1.3258	13.6155			(27)
External Wall 1	55.6000	10.2700	45.3300	0.1800	8.1594			(29a)
stair wall	22.2000	2.1000	20.1000	0.1800	3.6180			(29a)
External Roof 1	49.5000		49.5000	0.1300	6.4350			(30)
Total net area of external elements Aum(A, m2)			127.3000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.3479			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.4685	(36)
Total fabric heat loss						(33) + (36) =	49.8164	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	25.6600	25.4723	25.2884	24.4244	24.2627	23.5102	23.5102	23.3708	23.8001	24.2627	24.5897	24.9316	(38)
Heat transfer coeff	75.4764	75.2888	75.1048	74.2408	74.0791	73.3266	73.3266	73.1873	73.6165	74.0791	74.4062	74.7481	(39)
Average = Sum(39)m / 12 =												74.2400	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.5248	1.5210	1.5173	1.4998	1.4965	1.4813	1.4813	1.4785	1.4872	1.4965	1.5032	1.5101	(40)
HLP (average)												1.4998	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.6754 (42)
Average daily hot water use (litres/day)		73.9905 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	81.3896	78.4299	75.4703	72.5107	69.5511	66.5915	66.5915	69.5511	72.5107	75.4703	78.4299	81.3896	(44)
Energy conte	120.6984	105.5636	108.9321	94.9697	91.1257	78.6345	72.8664	83.6153	84.6139	98.6094	107.6399	116.8899	(45)
Energy content (annual)										Total = Sum(45)m =		1164.1588	(45)
Distribution loss (46)m = 0.15 x (45)m	18.1048	15.8345	16.3398	14.2455	13.6688	11.7952	10.9300	12.5423	12.6921	14.7914	16.1460	17.5335	(46)

Water storage loss:	
Store volume	2.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	0.2388 (48)
Temperature factor from Table 2b	0.5400 (49)
Enter (49) or (54) in (55)	0.1290 (55)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss
3.9977 3.6109 3.9977 3.8688 3.9977 3.8688 3.9977 3.9977 3.8688 3.9977 3.8688 3.9977 (56)
If cylinder contains dedicated solar storage
3.9977 3.6109 3.9977 3.8688 3.9977 3.8688 3.9977 3.9977 3.8688 3.9977 3.8688 3.9977 (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
147.9585 130.1856 136.1923 121.3505 118.3858 105.0153 100.1266 110.8755 110.9947 125.8695 134.0206 144.1501 (62)
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
147.9585 130.1856 136.1923 121.3505 118.3858 105.0153 100.1266 110.8755 110.9947 125.8695 134.0206 144.1501 (64)
Total per year (kWh/year) = Sum(64)m = 1485.1250 (64)
Heat gains from water heating, kWh/month
61.9403 54.7975 58.0280 52.6820 52.1074 47.2506 46.0362 49.6102 49.2388 54.5957 56.8949 60.6740 (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	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	13.0577	11.5978	9.4319	7.1406	5.3377	4.5063	4.8692	6.3292	8.4950	10.7863	12.5893	13.4206	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	145.9354	147.4497	143.6336	135.5095	125.2544	115.6159	109.1769	107.6625	111.4787	119.6027	129.8579	139.4963	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	(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)													
	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	(71)
Water heating gains (Table 5)													
	83.2531	81.5440	77.9947	73.1695	70.0368	65.6258	61.8766	66.6804	68.3872	73.3814	79.0207	81.5511	(72)
Total internal gains													
	293.3771	291.7223	282.1911	266.9505	251.7597	236.8789	227.0536	231.8029	239.4917	254.9013	272.5987	285.5989	(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	5.3800	19.6403	0.6300	0.7000	0.7700	32.2925	(76)
West	4.8900	19.6403	0.6300	0.7000	0.7700	29.3513	(80)

Solar gains	61.6438	120.5884	198.5919	289.6345	354.9579	363.3626	345.9360	297.1539	230.9706	143.0883	76.8626	50.6929	(83)
Total gains	355.0209	412.3107	480.7830	556.5849	606.7176	600.2415	572.9896	528.9568	470.4623	397.9896	349.4613	336.2918	(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	45.5440	45.6575	45.7694	46.3020	46.4031	46.8793	46.8793	46.9686	46.6947	46.4031	46.1991	45.9878	
alpha	4.0363	4.0438	4.0513	4.0868	4.0935	4.1253	4.1253	4.1312	4.1130	4.0935	4.0799	4.0659	
util living area													
	0.9957	0.9915	0.9793	0.9411	0.8511	0.6956	0.5388	0.5968	0.8340	0.9665	0.9921	0.9965	(86)
MIT	19.3892	19.5723	19.9007	20.3320	20.6921	20.9074	20.9751	20.9624	20.7934	20.3115	19.7743	19.3608	(87)
Th 2	19.6690	19.6718	19.6746	19.6876	19.6901	19.7015	19.7015	19.7036	19.6971	19.6901	19.6851	19.6800	(88)
util rest of house													
	0.9942	0.9885	0.9716	0.9182	0.7936	0.5866	0.3916	0.4471	0.7478	0.9490	0.9887	0.9953	(89)
MIT 2	17.5696	17.8378	18.3141	18.9305	19.4015	19.6439	19.6935	19.6898	19.5394	18.9172	18.1423	17.5353	(90)
Living area fraction									fLA = Living area / (4) =			0.4747	(91)
MIT	18.4334	18.6613	19.0673	19.5958	20.0142	20.2437	20.3019	20.2940	20.1347	19.5791	18.9171	18.4020	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4334	18.6613	19.0673	19.5958	20.0142	20.2437	20.3019	20.2940	20.1347	19.5791	18.9171	18.4020	(93)

---
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9921	0.9854	0.9670	0.9163	0.8097	0.6352	0.4621	0.5186	0.7807	0.9471	0.9859	0.9936	(94)
Useful gains	352.2176	406.2735	464.9174	509.9808	491.2399	381.2791	264.7523	274.3318	367.2934	376.9226	344.5353	334.1402	(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													
	1066.7409	1036.0695	943.8668	794.0681	615.9100	413.8365	271.4504	284.9905	444.2548	665.1670	879.2667	1061.5690	(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													
	531.6053	423.2230	356.3383	204.5428	92.7546	0.0000	0.0000	0.0000	0.0000	214.4538	385.0066	541.2070	(98)
Space heating												2749.1315	(98)
Space heating per m2											(98) / (4) =	55.5380	(99)

8c. Space cooling requirement

Not applicable

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												2940.2476	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	531.6053	423.2230	356.3383	204.5428	92.7546	0.0000	0.0000	0.0000	0.0000	214.4538	385.0066	541.2070	(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)	568.5619	452.6449	381.1105	218.7624	99.2028	0.0000	0.0000	0.0000	0.0000	229.3623	411.7718	578.8311	(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	147.9585	130.1856	136.1923	121.3505	118.3858	105.0153	100.1266	110.8755	110.9947	125.8695	134.0206	144.1501	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.9329	87.7327	87.2645	86.1964	84.1719	79.8000	79.8000	79.8000	79.8000	86.2240	87.4715	88.0177	(217)
Fuel for water heating, kWh/month	168.2630	148.3890	156.0683	140.7837	140.6477	131.5981	125.4719	138.9417	139.0911	145.9797	153.2164	163.7739	(219)
Water heating fuel used												1752.2245	(219)
Annual totals kWh/year													
Space heating fuel - main system												2940.2476	(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)												230.6035	(232)
Total delivered energy for all uses												4998.0756	(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	2940.2476	0.2160	635.0935	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1752.2245	0.2160	378.4805	(264)
Space and water heating			1013.5740	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	230.6035	0.5190	119.6832	(268)
Total CO2, kg/m2/year			1172.1822	(272)
Emissions per m2 for space and water heating			20.4762	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.4178	(272b)
Emissions per m2 for pumps and fans			0.7864	(272c)
Target Carbon Dioxide Emission Rate (TER) = (20.4762 * 1.00) + 2.4178 + 0.7864, rounded to 2 d.p.			23.6800	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	D-3-01	**Issued on Date**	05/02/2020
Assessment Reference	ASHP 46%	**Prop Type Ref**	2bed 3F
Property			

SAP Rating	83 B	**DER**	16.26	**TER**	23.68
Environmental	90 B	**% DER<TER**	31.34		
CO_2 Emissions (t/year)	0.63	**DFEE**	69.97	**TFEE**	73.17
General Requirements Compliance	Fail	**% DFEE<TFEE**	4.38		

Assessor Details	Miss Claudia Cioli, Claudia Cioli, Tel: 07481524839, clacioli@gmail.com	**Assessor ID**	R479-0001
Client			

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

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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England
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DWELLING AS DESIGNED

Mid-floor flat, total floor area 50 m²

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

1a TER and DER
Fuels for main heating:Mains gas (c), Electricity (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 23.68 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 16.26 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)73.2 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)70.0 kWh/m²/yrOK

---
2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	OK
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction

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

---
4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage Measured cylinder loss: 0.74 kWh/day
Permitted by DBSCG 0.32 Fail
Primary pipework insulated: No primary pipework

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

Hot water controls: No cylinderstat

---
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: 94%
Minimum: 70% OK

---
9 Summertime temperature
Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing East: 7.32 m², Overhang width less than twice window, ratio 1.00
Windows facing West: 6.66 m², No overhang
Air change rate: 0.50 ach
Blinds/curtains: None

---
10 Key features
Party wall U-value 0.00 W/m²K
Air permeability 3.0 m³/m²h
Photovoltaic array 0.50 kW

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	49.5000 (1b)	x	2.5500 (2b)	=	126.2250	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.5000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	126.2250	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							0 * 10 =	0.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.0000	
Infiltration rate		0.1500	(18)
Number of sides sheltered		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

If mechanical ventilation:	0.5000	(23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	79.9000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2774	0.2739	0.2705	0.2531	0.2497	0.2323	0.2323	0.2288	0.2393	0.2497	0.2566	0.2635	(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	
W29 (Uw = 1.40)			7.3200	1.3258	9.7045			(27)
W02 (Uw = 1.40)			6.6600	1.3258	8.8295			(27)
door			2.1000	1.4000	2.9400			(26a)
External Wall 1	55.6000	13.9800	41.6200	0.1800	7.4916	140.0000	5826.8000	(29a)
stair wall	22.2000	2.1000	20.1000	0.1800	3.6180	140.0000	2814.0000	(29a)
External Roof 1	49.5000		49.5000	0.1300	6.4350	9.0000	445.5000	(30)
Total net area of external elements Aum(A, m2)			127.3000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.0187			(33)
Party Wall 1			5.1000	0.0000	0.0000	140.0000	714.0000	(32)
Party Floor 1			49.5000			80.0000	3960.0000	(32d)
Internal Wall			64.4000			9.0000	579.6000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	14339.9000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		289.6949 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)		18.7175 (36)
Total fabric heat loss	(33) + (36) =	57.7362 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	11.5551	11.4107	11.2662	10.5437	10.3992	9.6768	9.6768	9.5323	9.9658	10.3992	10.6882	10.9772	(38)
Heat transfer coeff	69.2913	69.1469	69.0024	68.2799	68.1354	67.4130	67.4130	67.2685	67.7020	68.1354	68.4244	68.7134	(39)
Average = Sum(39)m / 12 =												68.2438	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3998	1.3969	1.3940	1.3794	1.3765	1.3619	1.3619	1.3590	1.3677	1.3765	1.3823	1.3881	(40)
HLP (average)												1.3787	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.6754 (42)
Average daily hot water use (litres/day)	77.8847 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	85.6732	82.5578	79.4424	76.3270	73.2117	70.0963	70.0963	73.2117	76.3270	79.4424	82.5578	85.6732	(44)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy conte	127.0509	111.1195	114.6654	99.9681	95.9218	82.7732	76.7015	88.0161	89.0673	103.7994	113.3051	123.0420	(45)
Energy content (annual)										Total = Sum(45)m =		1225.4303	(45)
Distribution loss (46)m = 0.15 x (45)m													
	19.0576	16.6679	17.1998	14.9952	14.3883	12.4160	11.5052	13.2024	13.3601	15.5699	16.9958	18.4563	(46)
Water storage loss:													
Store volume												2.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.7400	(48)
Temperature factor from Table 2b												1.0000	(49)
Enter (49) or (54) in (55)												0.7400	(55)
Total storage loss													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(56)
If cylinder contains dedicated solar storage													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(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													
	173.2533	152.8507	160.8678	144.6801	142.1242	127.4852	122.9039	134.2185	133.7793	150.0018	158.0171	169.2444	(62)
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													
	173.2533	152.8507	160.8678	144.6801	142.1242	127.4852	122.9039	134.2185	133.7793	150.0018	158.0171	169.2444	(64)
									Total per year (kWh/year) = Sum(64)m =			1769.4263	(64)
Heat gains from water heating, kWh/month													
	79.2063	70.3322	75.0882	69.0090	68.8559	63.2917	62.4652	66.2273	65.3845	71.4752	73.4436	77.8734	(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	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	13.0102	11.5556	9.3976	7.1146	5.3183	4.4899	4.8515	6.3062	8.4641	10.7471	12.5435	13.3718	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	145.9354	147.4497	143.6336	135.5095	125.2544	115.6159	109.1769	107.6625	111.4787	119.6027	129.8579	139.4963	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	(71)
Water heating gains (Table 5)													
	106.4601	104.6610	100.9250	95.8458	92.5483	87.9051	83.9586	89.0152	90.8118	96.0688	102.0049	104.6685	(72)
Total internal gains													
	313.5366	311.7972	302.0870	286.6008	271.2517	256.1418	246.1178	251.1147	258.8854	274.5495	292.5372	305.6675	(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	7.3200	19.6403	0.3700	0.8900	0.7700	32.8083	(76)
West	6.6600	19.6403	0.5600	0.6800	0.7700	34.5185	(80)

Solar gains	67.3268	131.7054	216.9001	316.3358	387.6814	396.8609	377.8278	324.5485	252.2638	156.2796	83.9486	55.3662	(83)
Total gains	380.8634	443.5026	518.9871	602.9366	658.9331	653.0027	623.9456	575.6632	511.1491	430.8291	376.4857	361.0338	(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	57.4863	57.6065	57.7271	58.3379	58.4616	59.0881	59.0881	59.2150	58.8359	58.4616	58.2147	57.9699	
alpha	4.8324	4.8404	4.8485	4.8892	4.8974	4.9392	4.9392	4.9477	4.9224	4.8974	4.8810	4.8647	
util living area													
	0.9969	0.9930	0.9796	0.9313	0.8138	0.6291	0.4690	0.5257	0.7917	0.9638	0.9934	0.9976	(86)
MIT	19.7403	19.9093	20.2019	20.5698	20.8416	20.9663	20.9935	20.9889	20.8983	20.5229	20.0624	19.7109	(87)
Th 2	19.7635	19.7657	19.7679	19.7792	19.7814	19.7927	19.7927	19.7949	19.7882	19.7814	19.7769	19.7724	(88)
util rest of house													
	0.9956	0.9902	0.9713	0.9040	0.7484	0.5243	0.3438	0.3942	0.6967	0.9436	0.9903	0.9966	(89)
MIT 2	18.1207	18.3679	18.7908	19.3084	19.6445	19.7744	19.7909	19.7915	19.7191	19.2598	18.6001	18.0840	(90)
Living area fraction									fLA = Living area / (4) =			0.4747	(91)
MIT	18.8896	19.0997	19.4607	19.9073	20.2128	20.3403	20.3618	20.3600	20.2789	19.8595	19.2943	18.8564	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8896	19.0997	19.4607	19.9073	20.2128	20.3403	20.3618	20.3600	20.2789	19.8595	19.2943	18.8564	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9944	0.9882	0.9687	0.9074	0.7735	0.5735	0.4036	0.4572	0.7386	0.9453	0.9886	0.9956	(94)
Useful gains	378.7343	438.2615	502.7463	547.0783	509.6774	374.5182	251.8246	263.1880	377.5536	407.2436	372.1979	359.4543	(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													
	1010.9322	981.8646	894.3196	751.5743	580.0223	386.9684	253.5965	266.3821	418.3223	630.8968	834.3898	1007.0878	(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													
	470.3552	365.3013	291.3306	147.2371	52.3366	0.0000	0.0000	0.0000	0.0000	166.3979	332.7782	481.8393	(98)
Space heating												2307.5762	(98)
Space heating per m2											(98) / (4) =	46.6177	(99)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)		0.0000 (301)
Fraction of space heat from community system		1.0000 (302)
Fraction of heat from community Heat pump		0.4600 (303a)
Fraction of heat from community Boilers		0.5400 (303b)
Fraction of total space heat from community Heat pump		0.4600 (304a)
Fraction of total space heat from community Boilers		0.5400 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating		1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating		1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system		1.0500 (306)
Space heating:		
Annual space heating requirement		2307.5762 (98)
Space heat from Heat pump = (98) x 0.46 x 1.00 x 1.05		1114.5593 (307a)
Space heat from Boilers = (98) x 0.54 x 1.00 x 1.05		1308.3957 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0.0000 (308)
Space heating fuel for secondary/supplementary system		0.0000 (309)
Water heating		
Annual water heating requirement		1769.4263 (64)
Water heat from Heat pump = (64) x 0.46 x 1.00 x 1.05		854.6329 (310a)
Water heat from Boilers = (64) x 0.54 x 1.00 x 1.05		1003.2647 (310b)
Electricity used for heat distribution		42.8085 (313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.2500, SFP = 0.6625)		
mechanical ventilation fans (SFP = 0.6625)		102.0214 (330a)
Total electricity for the above, kWh/year		102.0214 (331)
Electricity for lighting (calculated in Appendix L)		229.7650 (332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV Unit 0 (0.80 * 0.50 * 951 * 1.00) =	-380.2464	-380.2464 (333)
Total delivered energy for all uses		4232.3925 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			370.0000	(367a)
Space heating from Heat pump	532.2141	0.5190	276.2191	(367)
Efficiency of heat source Boilers			93.9000	(367b)
Space heating from Boilers	2461.8322	0.2160	531.7557	(368)
Electrical energy for heat distribution	42.8085	0.5190	22.2176	(372)
Total CO2 associated with community systems			830.1925	(373)
(negative value allowed since DFEE <= TFEE)				
Space and water heating			830.1925	(376)
Pumps and fans	102.0214	0.5190	52.9491	(378)
Energy for lighting	229.7650	0.5190	119.2480	(379)
Energy saving/generation technologies				
PV Unit	-380.2464	0.5190	-197.3479	(380)
Total CO2, kg/year			805.0417	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			16.2600	(384)

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

DER		16.2600	ZC1
Total Floor Area	TFA	49.5000	
Assumed number of occupants	N	1.6754	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.4704	ZC2
CO2 emissions from cooking, equation (L16)		3.2164	ZC3
Total CO2 emissions		36.9467	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		36.9467	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	49.5000 (1b)	x	2.5500 (2b)	=	126.2250	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.5000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	126.2250	(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)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1584	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.4084	(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) =	0.3778	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4817	0.4723	0.4628	0.4156	0.4061	0.3589	0.3589	0.3495	0.3778	0.4061	0.4250	0.4439	(22b)
Effective ac	0.6160	0.6115	0.6071	0.5864	0.5825	0.5644	0.5644	0.5611	0.5714	0.5825	0.5903	0.5985	(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 Semi-glazed door			2.1000	1.2000	2.5200			(26a)
TER Opening Type (Uw = 1.40)			10.2700	1.3258	13.6155			(27)
External Wall 1	55.6000	10.2700	45.3300	0.1800	8.1594			(29a)
stair wall	22.2000	2.1000	20.1000	0.1800	3.6180			(29a)
External Roof 1	49.5000		49.5000	0.1300	6.4350			(30)
Total net area of external elements Aum(A, m2)			127.3000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.3479			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.4685	(36)
Total fabric heat loss						(33) + (36) =	49.8164	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	25.6600	25.4723	25.2884	24.4244	24.2627	23.5102	23.5102	23.3708	23.8001	24.2627	24.5897	24.9316	(38)
Heat transfer coeff	75.4764	75.2888	75.1048	74.2408	74.0791	73.3266	73.3266	73.1873	73.6165	74.0791	74.4062	74.7481	(39)
Average = Sum(39)m / 12 =												74.2400	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.5248	1.5210	1.5173	1.4998	1.4965	1.4813	1.4813	1.4785	1.4872	1.4965	1.5032	1.5101	(40)
HLP (average)												1.4998	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.6754 (42)
Average daily hot water use (litres/day)		73.9905 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	81.3896	78.4299	75.4703	72.5107	69.5511	66.5915	66.5915	69.5511	72.5107	75.4703	78.4299	81.3896	(44)
Energy conte	120.6984	105.5636	108.9321	94.9697	91.1257	78.6345	72.8664	83.6153	84.6139	98.6094	107.6399	116.8899	(45)
Energy content (annual)										Total = Sum(45)m =		1164.1588	(45)
Distribution loss (46)m = 0.15 x (45)m	18.1048	15.8345	16.3398	14.2455	13.6688	11.7952	10.9300	12.5423	12.6921	14.7914	16.1460	17.5335	(46)

Water storage loss:	
Store volume	2.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	0.2388 (48)
Temperature factor from Table 2b	0.5400 (49)
Enter (49) or (54) in (55)	0.1290 (55)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss
3.9977 3.6109 3.9977 3.8688 3.9977 3.8688 3.9977 3.9977 3.8688 3.9977 3.8688 3.9977 (56)
If cylinder contains dedicated solar storage
3.9977 3.6109 3.9977 3.8688 3.9977 3.8688 3.9977 3.9977 3.8688 3.9977 3.8688 3.9977 (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
147.9585 130.1856 136.1923 121.3505 118.3858 105.0153 100.1266 110.8755 110.9947 125.8695 134.0206 144.1501 (62)
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
147.9585 130.1856 136.1923 121.3505 118.3858 105.0153 100.1266 110.8755 110.9947 125.8695 134.0206 144.1501 (64)
Total per year (kWh/year) = Sum(64)m = 1485.1250 (64)
Heat gains from water heating, kWh/month
61.9403 54.7975 58.0280 52.6820 52.1074 47.2506 46.0362 49.6102 49.2388 54.5957 56.8949 60.6740 (65)

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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	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	13.0577	11.5978	9.4319	7.1406	5.3377	4.5063	4.8692	6.3292	8.4950	10.7863	12.5893	13.4206	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	145.9354	147.4497	143.6336	135.5095	125.2544	115.6159	109.1769	107.6625	111.4787	119.6027	129.8579	139.4963	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	(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)													
	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	(71)
Water heating gains (Table 5)													
	83.2531	81.5440	77.9947	73.1695	70.0368	65.6258	61.8766	66.6804	68.3872	73.3814	79.0207	81.5511	(72)
Total internal gains													
	293.3771	291.7223	282.1911	266.9505	251.7597	236.8789	227.0536	231.8029	239.4917	254.9013	272.5987	285.5989	(73)

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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	5.3800	19.6403	0.6300	0.7000	0.7700	32.2925	(76)
West	4.8900	19.6403	0.6300	0.7000	0.7700	29.3513	(80)

Solar gains	61.6438	120.5884	198.5919	289.6345	354.9579	363.3626	345.9360	297.1539	230.9706	143.0883	76.8626	50.6929	(83)
Total gains	355.0209	412.3107	480.7830	556.5849	606.7176	600.2415	572.9896	528.9568	470.4623	397.9896	349.4613	336.2918	(84)

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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	45.5440	45.6575	45.7694	46.3020	46.4031	46.8793	46.8793	46.9686	46.6947	46.4031	46.1991	45.9878	
alpha	4.0363	4.0438	4.0513	4.0868	4.0935	4.1253	4.1253	4.1312	4.1130	4.0935	4.0799	4.0659	
util living area													
	0.9957	0.9915	0.9793	0.9411	0.8511	0.6956	0.5388	0.5968	0.8340	0.9665	0.9921	0.9965	(86)
MIT	19.3892	19.5723	19.9007	20.3320	20.6921	20.9074	20.9751	20.9624	20.7934	20.3115	19.7743	19.3608	(87)
Th 2	19.6690	19.6718	19.6746	19.6876	19.6901	19.7015	19.7015	19.7036	19.6971	19.6901	19.6851	19.6800	(88)
util rest of house													
	0.9942	0.9885	0.9716	0.9182	0.7936	0.5866	0.3916	0.4471	0.7478	0.9490	0.9887	0.9953	(89)
MIT 2	17.5696	17.8378	18.3141	18.9305	19.4015	19.6439	19.6935	19.6898	19.5394	18.9172	18.1423	17.5353	(90)
Living area fraction									fLA = Living area / (4) =			0.4747	(91)
MIT	18.4334	18.6613	19.0673	19.5958	20.0142	20.2437	20.3019	20.2940	20.1347	19.5791	18.9171	18.4020	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4334	18.6613	19.0673	19.5958	20.0142	20.2437	20.3019	20.2940	20.1347	19.5791	18.9171	18.4020	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9921	0.9854	0.9670	0.9163	0.8097	0.6352	0.4621	0.5186	0.7807	0.9471	0.9859	0.9936	(94)
Useful gains	352.2176	406.2735	464.9174	509.9808	491.2399	381.2791	264.7523	274.3318	367.2934	376.9226	344.5353	334.1402	(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													
	1066.7409	1036.0695	943.8668	794.0681	615.9100	413.8365	271.4504	284.9905	444.2548	665.1670	879.2667	1061.5690	(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													
	531.6053	423.2230	356.3383	204.5428	92.7546	0.0000	0.0000	0.0000	0.0000	214.4538	385.0066	541.2070	(98)
Space heating												2749.1315	(98)
Space heating per m2											(98) / (4) =	55.5380	(99)

8c. Space cooling requirement

Not applicable

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												2940.2476	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	531.6053	423.2230	356.3383	204.5428	92.7546	0.0000	0.0000	0.0000	0.0000	214.4538	385.0066	541.2070	(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)	568.5619	452.6449	381.1105	218.7624	99.2028	0.0000	0.0000	0.0000	0.0000	229.3623	411.7718	578.8311	(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	147.9585	130.1856	136.1923	121.3505	118.3858	105.0153	100.1266	110.8755	110.9947	125.8695	134.0206	144.1501	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.9329	87.7327	87.2645	86.1964	84.1719	79.8000	79.8000	79.8000	79.8000	86.2240	87.4715	88.0177	(217)
Fuel for water heating, kWh/month	168.2630	148.3890	156.0683	140.7837	140.6477	131.5981	125.4719	138.9417	139.0911	145.9797	153.2164	163.7739	(219)
Water heating fuel used												1752.2245	(219)
Annual totals kWh/year													
Space heating fuel - main system												2940.2476	(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)												230.6035	(232)
Total delivered energy for all uses												4998.0756	(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	2940.2476	0.2160	635.0935	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1752.2245	0.2160	378.4805	(264)
Space and water heating			1013.5740	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	230.6035	0.5190	119.6832	(268)
Total CO2, kg/m2/year			1172.1822	(272)
Emissions per m2 for space and water heating			20.4762	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.4178	(272b)
Emissions per m2 for pumps and fans			0.7864	(272c)
Target Carbon Dioxide Emission Rate (TER) = (20.4762 * 1.00) + 2.4178 + 0.7864, rounded to 2 d.p.			23.6800	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	D-3-01	**Issued on Date**	14/01/2020
Assessment Reference	ASHP 50%	**Prop Type Ref**	2bed 3F
Property			

SAP Rating	82 B	**DER**	17.26	**TER**	23.68
Environmental	89 B	**% DER<TER**	27.11		
CO_2 Emissions (t/year)	0.67	**DFEE**	69.97	**TFEE**	73.17
General Requirements Compliance	Fail	**% DFEE<TFEE**	4.38		

Assessor Details	Miss Claudia Cioli, Claudia Cioli, Tel: 07481524839, clacioli@gmail.com	**Assessor ID**	R479-0001
Client			

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DWELLING AS DESIGNED

Mid-floor flat, total floor area 50 m²

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

1a TER and DER
Fuels for main heating:Mains gas (c), Electricity (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 23.68 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 17.26 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)73.2 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)70.0 kWh/m²/yrOK

---
2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	OK
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction

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

---
4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage Measured cylinder loss: 0.74 kWh/day
Permitted by DBSCG 0.32 Fail
Primary pipework insulated: No primary pipework

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

Hot water controls: No cylinderstat

---
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: 94%
Minimum: 70% OK

---
9 Summertime temperature
Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing East: 7.32 m², Overhang width less than twice window, ratio 1.00
Windows facing West: 6.66 m², No overhang
Air change rate: 0.50 ach
Blinds/curtains: None

---
10 Key features
Party wall U-value 0.00 W/m²K
Air permeability 3.0 m³/m²h
Photovoltaic array 0.50 kW

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	49.5000 (1b)	x	2.5500 (2b)	=	126.2250	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.5000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	126.2250	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							0 * 10 =	0.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.0000	
Infiltration rate		0.1500	(18)
Number of sides sheltered		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

If mechanical ventilation:	0.5000	(23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	79.9000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2774	0.2739	0.2705	0.2531	0.2497	0.2323	0.2323	0.2288	0.2393	0.2497	0.2566	0.2635	(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	
W29 (Uw = 1.40)			7.3200	1.3258	9.7045			(27)
W02 (Uw = 1.40)			6.6600	1.3258	8.8295			(27)
door			2.1000	1.4000	2.9400			(26a)
External Wall 1	55.6000	13.9800	41.6200	0.1800	7.4916	140.0000	5826.8000	(29a)
stair wall	22.2000	2.1000	20.1000	0.1800	3.6180	140.0000	2814.0000	(29a)
External Roof 1	49.5000		49.5000	0.1300	6.4350	9.0000	445.5000	(30)
Total net area of external elements Aum(A, m2)			127.3000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.0187			(33)
Party Wall 1			5.1000	0.0000	0.0000	140.0000	714.0000	(32)
Party Floor 1			49.5000			80.0000	3960.0000	(32d)
Internal Wall			64.4000			9.0000	579.6000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	14339.9000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		289.6949 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)		18.7175 (36)
Total fabric heat loss	(33) + (36) =	57.7362 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	11.5551	11.4107	11.2662	10.5437	10.3992	9.6768	9.6768	9.5323	9.9658	10.3992	10.6882	10.9772	(38)
Heat transfer coeff	69.2913	69.1469	69.0024	68.2799	68.1354	67.4130	67.4130	67.2685	67.7020	68.1354	68.4244	68.7134	(39)
Average = Sum(39)m / 12 =												68.2438	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3998	1.3969	1.3940	1.3794	1.3765	1.3619	1.3619	1.3590	1.3677	1.3765	1.3823	1.3881	(40)
HLP (average)												1.3787	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.6754 (42)
Average daily hot water use (litres/day)	77.8847 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	85.6732	82.5578	79.4424	76.3270	73.2117	70.0963	70.0963	73.2117	76.3270	79.4424	82.5578	85.6732	(44)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy conte	127.0509	111.1195	114.6654	99.9681	95.9218	82.7732	76.7015	88.0161	89.0673	103.7994	113.3051	123.0420	(45)
Energy content (annual)										Total = Sum(45)m =		1225.4303	(45)
Distribution loss (46)m = 0.15 x (45)m													
	19.0576	16.6679	17.1998	14.9952	14.3883	12.4160	11.5052	13.2024	13.3601	15.5699	16.9958	18.4563	(46)
Water storage loss:													
Store volume												2.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.7400	(48)
Temperature factor from Table 2b												1.0000	(49)
Enter (49) or (54) in (55)												0.7400	(55)
Total storage loss													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(56)
If cylinder contains dedicated solar storage													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(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													
	173.2533	152.8507	160.8678	144.6801	142.1242	127.4852	122.9039	134.2185	133.7793	150.0018	158.0171	169.2444	(62)
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													
	173.2533	152.8507	160.8678	144.6801	142.1242	127.4852	122.9039	134.2185	133.7793	150.0018	158.0171	169.2444	(64)
									Total per year (kWh/year) = Sum(64)m =			1769.4263	(64)
Heat gains from water heating, kWh/month													
	79.2063	70.3322	75.0882	69.0090	68.8559	63.2917	62.4652	66.2273	65.3845	71.4752	73.4436	77.8734	(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	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	13.0102	11.5556	9.3976	7.1146	5.3183	4.4899	4.8515	6.3062	8.4641	10.7471	12.5435	13.3718	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	145.9354	147.4497	143.6336	135.5095	125.2544	115.6159	109.1769	107.6625	111.4787	119.6027	129.8579	139.4963	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	(71)
Water heating gains (Table 5)													
	106.4601	104.6610	100.9250	95.8458	92.5483	87.9051	83.9586	89.0152	90.8118	96.0688	102.0049	104.6685	(72)
Total internal gains													
	313.5366	311.7972	302.0870	286.6008	271.2517	256.1418	246.1178	251.1147	258.8854	274.5495	292.5372	305.6675	(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	7.3200	19.6403	0.3700	0.8900	0.7700	32.8083	(76)
West	6.6600	19.6403	0.5600	0.6800	0.7700	34.5185	(80)

Solar gains	67.3268	131.7054	216.9001	316.3358	387.6814	396.8609	377.8278	324.5485	252.2638	156.2796	83.9486	55.3662	(83)
Total gains	380.8634	443.5026	518.9871	602.9366	658.9331	653.0027	623.9456	575.6632	511.1491	430.8291	376.4857	361.0338	(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	57.4863	57.6065	57.7271	58.3379	58.4616	59.0881	59.0881	59.2150	58.8359	58.4616	58.2147	57.9699	
alpha	4.8324	4.8404	4.8485	4.8892	4.8974	4.9392	4.9392	4.9477	4.9224	4.8974	4.8810	4.8647	
util living area													
	0.9969	0.9930	0.9796	0.9313	0.8138	0.6291	0.4690	0.5257	0.7917	0.9638	0.9934	0.9976	(86)
MIT	19.7403	19.9093	20.2019	20.5698	20.8416	20.9663	20.9935	20.9889	20.8983	20.5229	20.0624	19.7109	(87)
Th 2	19.7635	19.7657	19.7679	19.7792	19.7814	19.7927	19.7927	19.7949	19.7882	19.7814	19.7769	19.7724	(88)
util rest of house													
	0.9956	0.9902	0.9713	0.9040	0.7484	0.5243	0.3438	0.3942	0.6967	0.9436	0.9903	0.9966	(89)
MIT 2	18.1207	18.3679	18.7908	19.3084	19.6445	19.7744	19.7909	19.7915	19.7191	19.2598	18.6001	18.0840	(90)
Living area fraction									fLA = Living area / (4) =			0.4747	(91)
MIT	18.8896	19.0997	19.4607	19.9073	20.2128	20.3403	20.3618	20.3600	20.2789	19.8595	19.2943	18.8564	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8896	19.0997	19.4607	19.9073	20.2128	20.3403	20.3618	20.3600	20.2789	19.8595	19.2943	18.8564	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9944	0.9882	0.9687	0.9074	0.7735	0.5735	0.4036	0.4572	0.7386	0.9453	0.9886	0.9956	(94)
Useful gains	378.7343	438.2615	502.7463	547.0783	509.6774	374.5182	251.8246	263.1880	377.5536	407.2436	372.1979	359.4543	(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													
	1010.9322	981.8646	894.3196	751.5743	580.0223	386.9684	253.5965	266.3821	418.3223	630.8968	834.3898	1007.0878	(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													
	470.3552	365.3013	291.3306	147.2371	52.3366	0.0000	0.0000	0.0000	0.0000	166.3979	332.7782	481.8393	(98)
Space heating												2307.5762	(98)
Space heating per m2											(98) / (4) =	46.6177	(99)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump	0.5000	(303a)
Fraction of heat from community Boilers	0.5000	(303b)
Fraction of total space heat from community Heat pump	0.5000	(304a)
Fraction of total space heat from community Boilers	0.5000	(304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.1000	(306)
Space heating:		
Annual space heating requirement	2307.5762	(98)
Space heat from Heat pump = (98) x 0.50 x 1.00 x 1.10	1269.1669	(307a)
Space heat from Boilers = (98) x 0.50 x 1.00 x 1.10	1269.1669	(307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	1769.4263	(64)
Water heat from Heat pump = (64) x 0.50 x 1.00 x 1.10	973.1845	(310a)
Water heat from Boilers = (64) x 0.50 x 1.00 x 1.10	973.1845	(310b)
Electricity used for heat distribution	44.8470	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.2500, SFP = 0.6625)		
mechanical ventilation fans (SFP = 0.6625)	102.0214	(330a)
Total electricity for the above, kWh/year	102.0214	(331)
Electricity for lighting (calculated in Appendix L)	229.7650	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV Unit 0 (0.80 * 0.50 * 951 * 1.00) = -380.2464	-380.2464	(333)
Total delivered energy for all uses	4436.2427	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			342.0000	(367a)
Space heating from Heat pump	655.6583	0.5190	340.2867	(367)
Efficiency of heat source Boilers			93.9000	(367b)
Space heating from Boilers	2388.0206	0.2160	515.8125	(368)
Electrical energy for heat distribution	44.8470	0.5190	23.2756	(372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			879.3747	(373)
Space and water heating			879.3747	(376)
Pumps and fans	102.0214	0.5190	52.9491	(378)
Energy for lighting	229.7650	0.5190	119.2480	(379)
Energy saving/generation technologies				
PV Unit	-380.2464	0.5190	-197.3479	(380)
Total CO2, kg/year			854.2239	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			17.2600	(384)

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

DER		17.2600	ZC1
Total Floor Area	TFA	49.5000	
Assumed number of occupants	N	1.6754	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.4704	ZC2
CO2 emissions from cooking, equation (L16)		3.2164	ZC3
Total CO2 emissions		37.9467	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		37.9467	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	49.5000 (1b)	x	2.5500 (2b)	=	126.2250	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.5000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	126.2250	(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)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1584	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.4084	(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) =	0.3778	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4817	0.4723	0.4628	0.4156	0.4061	0.3589	0.3589	0.3495	0.3778	0.4061	0.4250	0.4439	(22b)
Effective ac	0.6160	0.6115	0.6071	0.5864	0.5825	0.5644	0.5644	0.5611	0.5714	0.5825	0.5903	0.5985	(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 Semi-glazed door			2.1000	1.2000	2.5200			(26a)
TER Opening Type (Uw = 1.40)			10.2700	1.3258	13.6155			(27)
External Wall 1	55.6000	10.2700	45.3300	0.1800	8.1594			(29a)
stair wall	22.2000	2.1000	20.1000	0.1800	3.6180			(29a)
External Roof 1	49.5000		49.5000	0.1300	6.4350			(30)
Total net area of external elements Aum(A, m2)			127.3000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.3479			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.4685	(36)
Total fabric heat loss						(33) + (36) =	49.8164	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	25.6600	25.4723	25.2884	24.4244	24.2627	23.5102	23.5102	23.3708	23.8001	24.2627	24.5897	24.9316	(38)
Heat transfer coeff	75.4764	75.2888	75.1048	74.2408	74.0791	73.3266	73.3266	73.1873	73.6165	74.0791	74.4062	74.7481	(39)
Average = Sum(39)m / 12 =												74.2400	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.5248	1.5210	1.5173	1.4998	1.4965	1.4813	1.4813	1.4785	1.4872	1.4965	1.5032	1.5101	(40)
HLP (average)												1.4998	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.6754 (42)
Average daily hot water use (litres/day)		73.9905 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	81.3896	78.4299	75.4703	72.5107	69.5511	66.5915	66.5915	69.5511	72.5107	75.4703	78.4299	81.3896	(44)
Energy conte	120.6984	105.5636	108.9321	94.9697	91.1257	78.6345	72.8664	83.6153	84.6139	98.6094	107.6399	116.8899	(45)
Energy content (annual)										Total = Sum(45)m =		1164.1588	(45)
Distribution loss (46)m = 0.15 x (45)m	18.1048	15.8345	16.3398	14.2455	13.6688	11.7952	10.9300	12.5423	12.6921	14.7914	16.1460	17.5335	(46)

Water storage loss:	
Store volume	2.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	0.2388 (48)
Temperature factor from Table 2b	0.5400 (49)
Enter (49) or (54) in (55)	0.1290 (55)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss
3.9977 3.6109 3.9977 3.8688 3.9977 3.8688 3.9977 3.9977 3.8688 3.9977 3.8688 3.9977 (56)
If cylinder contains dedicated solar storage
3.9977 3.6109 3.9977 3.8688 3.9977 3.8688 3.9977 3.9977 3.8688 3.9977 3.8688 3.9977 (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
147.9585 130.1856 136.1923 121.3505 118.3858 105.0153 100.1266 110.8755 110.9947 125.8695 134.0206 144.1501 (62)
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
147.9585 130.1856 136.1923 121.3505 118.3858 105.0153 100.1266 110.8755 110.9947 125.8695 134.0206 144.1501 (64)
Total per year (kWh/year) = Sum(64)m = 1485.1250 (64)
Heat gains from water heating, kWh/month
61.9403 54.7975 58.0280 52.6820 52.1074 47.2506 46.0362 49.6102 49.2388 54.5957 56.8949 60.6740 (65)

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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	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	83.7695	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	13.0577	11.5978	9.4319	7.1406	5.3377	4.5063	4.8692	6.3292	8.4950	10.7863	12.5893	13.4206	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	145.9354	147.4497	143.6336	135.5095	125.2544	115.6159	109.1769	107.6625	111.4787	119.6027	129.8579	139.4963	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	31.3769	(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)													
	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	-67.0156	(71)
Water heating gains (Table 5)													
	83.2531	81.5440	77.9947	73.1695	70.0368	65.6258	61.8766	66.6804	68.3872	73.3814	79.0207	81.5511	(72)
Total internal gains													
	293.3771	291.7223	282.1911	266.9505	251.7597	236.8789	227.0536	231.8029	239.4917	254.9013	272.5987	285.5989	(73)

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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	5.3800	19.6403	0.6300	0.7000	0.7700	32.2925	(76)
West	4.8900	19.6403	0.6300	0.7000	0.7700	29.3513	(80)

Solar gains	61.6438	120.5884	198.5919	289.6345	354.9579	363.3626	345.9360	297.1539	230.9706	143.0883	76.8626	50.6929	(83)
Total gains	355.0209	412.3107	480.7830	556.5849	606.7176	600.2415	572.9896	528.9568	470.4623	397.9896	349.4613	336.2918	(84)

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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	45.5440	45.6575	45.7694	46.3020	46.4031	46.8793	46.8793	46.9686	46.6947	46.4031	46.1991	45.9878	
alpha	4.0363	4.0438	4.0513	4.0868	4.0935	4.1253	4.1253	4.1312	4.1130	4.0935	4.0799	4.0659	
util living area													
	0.9957	0.9915	0.9793	0.9411	0.8511	0.6956	0.5388	0.5968	0.8340	0.9665	0.9921	0.9965	(86)
MIT	19.3892	19.5723	19.9007	20.3320	20.6921	20.9074	20.9751	20.9624	20.7934	20.3115	19.7743	19.3608	(87)
Th 2	19.6690	19.6718	19.6746	19.6876	19.6901	19.7015	19.7015	19.7036	19.6971	19.6901	19.6851	19.6800	(88)
util rest of house													
	0.9942	0.9885	0.9716	0.9182	0.7936	0.5866	0.3916	0.4471	0.7478	0.9490	0.9887	0.9953	(89)
MIT 2	17.5696	17.8378	18.3141	18.9305	19.4015	19.6439	19.6935	19.6898	19.5394	18.9172	18.1423	17.5353	(90)
Living area fraction									fLA = Living area / (4) =			0.4747	(91)
MIT	18.4334	18.6613	19.0673	19.5958	20.0142	20.2437	20.3019	20.2940	20.1347	19.5791	18.9171	18.4020	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4334	18.6613	19.0673	19.5958	20.0142	20.2437	20.3019	20.2940	20.1347	19.5791	18.9171	18.4020	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9921	0.9854	0.9670	0.9163	0.8097	0.6352	0.4621	0.5186	0.7807	0.9471	0.9859	0.9936	(94)
Useful gains	352.2176	406.2735	464.9174	509.9808	491.2399	381.2791	264.7523	274.3318	367.2934	376.9226	344.5353	334.1402	(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													
	1066.7409	1036.0695	943.8668	794.0681	615.9100	413.8365	271.4504	284.9905	444.2548	665.1670	879.2667	1061.5690	(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													
	531.6053	423.2230	356.3383	204.5428	92.7546	0.0000	0.0000	0.0000	0.0000	214.4538	385.0066	541.2070	(98)
Space heating												2749.1315	(98)
Space heating per m2											(98) / (4) =	55.5380	(99)

8c. Space cooling requirement

Not applicable

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												2940.2476	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	531.6053	423.2230	356.3383	204.5428	92.7546	0.0000	0.0000	0.0000	0.0000	214.4538	385.0066	541.2070	(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)	568.5619	452.6449	381.1105	218.7624	99.2028	0.0000	0.0000	0.0000	0.0000	229.3623	411.7718	578.8311	(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	147.9585	130.1856	136.1923	121.3505	118.3858	105.0153	100.1266	110.8755	110.9947	125.8695	134.0206	144.1501	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.9329	87.7327	87.2645	86.1964	84.1719	79.8000	79.8000	79.8000	79.8000	86.2240	87.4715	88.0177	(217)
Fuel for water heating, kWh/month	168.2630	148.3890	156.0683	140.7837	140.6477	131.5981	125.4719	138.9417	139.0911	145.9797	153.2164	163.7739	(219)
Water heating fuel used												1752.2245	(219)
Annual totals kWh/year													
Space heating fuel - main system												2940.2476	(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)												230.6035	(232)
Total delivered energy for all uses												4998.0756	(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	2940.2476	0.2160	635.0935	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1752.2245	0.2160	378.4805	(264)
Space and water heating			1013.5740	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	230.6035	0.5190	119.6832	(268)
Total CO2, kg/m2/year			1172.1822	(272)
Emissions per m2 for space and water heating			20.4762	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.4178	(272b)
Emissions per m2 for pumps and fans			0.7864	(272c)
Target Carbon Dioxide Emission Rate (TER) = (20.4762 * 1.00) + 2.4178 + 0.7864, rounded to 2 d.p.			23.6800	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	D-3-02	**Issued on Date**	05/02/2020
Assessment Reference	ASHP-1-2	**Prop Type Ref**	2bed 3F
Property			

SAP Rating	84 B	**DER**	14.67	**TER**	21.72
Environmental	91 B	**% DER<TER**	32.46		
CO_2 Emissions (t/year)	0.60	**DFEE**	61.35	**TFEE**	63.85
General Requirements Compliance	Fail	**% DFEE<TFEE**	3.90		

Assessor Details	Miss Claudia Cioli, Claudia Cioli, Tel: 07481524839, clacioli@gmail.com	**Assessor ID**	R479-0001
Client			

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

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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England
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DWELLING AS DESIGNED

Top-floor flat, total floor area 51 m²

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

1a TER and DER
Fuels for main heating:Mains gas (c), Electricity (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 21.72 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 14.67 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)63.8 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)61.4 kWh/m²/yrOK

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2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	OK
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction

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

---
4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage Measured cylinder loss: 0.74 kWh/day
Permitted by DBSCG 0.32 Fail
Primary pipework insulated: No primary pipework

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

Hot water controls: No cylinderstat

---
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: 94%
Minimum: 70% OK

---
9 Summertime temperature
Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing East: 3.33 m², No overhang
Windows facing South: 12.19 m², No overhang
Air change rate: 0.50 ach
Blinds/curtains: None

---
10 Key features
Party wall U-value 0.00 W/m²K
Air permeability 3.0 m³/m²h
Photovoltaic array 0.50 kW

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	51.4000 (1b)	x	2.5500 (2b)	=	131.0700	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.4000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	131.0700	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							0 * 10 =	0.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.0000	
Infiltration rate		0.1500	(18)
Number of sides sheltered		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

If mechanical ventilation:	0.5000	(23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	79.9000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2774	0.2739	0.2705	0.2531	0.2497	0.2323	0.2323	0.2288	0.2393	0.2497	0.2566	0.2635	(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	
W03 (Uw = 1.40)			8.3900	1.3258	11.1231			(27)
W02 (Uw = 1.40)			7.1300	1.3258	9.4527			(27)
door			2.1000	1.4000	2.9400			(26a)
External Wall 1	57.1000	15.5200	41.5800	0.1800	7.4844	140.0000	5821.2000	(29a)
stair wall	13.5000	2.1000	11.4000	0.1800	2.0520	140.0000	1596.0000	(29a)
External Roof 1	51.4000		51.4000	0.1300	6.6820	9.0000	462.6000	(30)
Total net area of external elements Aum(A, m2)			122.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		39.7342			(33)
Party Wall 1			8.4000	0.0000	0.0000	140.0000	1176.0000	(32)
Party Floor 1			51.4000			80.0000	4112.0000	(32d)
Internal Wall			95.0000			9.0000	855.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	14022.8000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		272.8171 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)		19.6885 (36)
Total fabric heat loss	(33) + (36) =	59.4227 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	11.9987	11.8486	11.6986	10.9484	10.7984	10.0482	10.0482	9.8982	10.3483	10.7984	11.0985	11.3985	(38)
Heat transfer coeff	71.4213	71.2713	71.1213	70.3711	70.2211	69.4709	69.4709	69.3209	69.7710	70.2211	70.5211	70.8212	(39)
Average = Sum(39)m / 12 =												70.3336	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3895	1.3866	1.3837	1.3691	1.3662	1.3516	1.3516	1.3487	1.3574	1.3662	1.3720	1.3778	(40)
HLP (average)												1.3684	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.7314 (42)
Average daily hot water use (litres/day)	79.2842 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	87.2127	84.0413	80.8699	77.6986	74.5272	71.3558	71.3558	74.5272	77.6986	80.8699	84.0413	87.2127	(44)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy conte	129.3339	113.1162	116.7258	101.7644	97.6454	84.2605	78.0798	89.5977	90.6677	105.6645	115.3411	125.2529	(45)
Energy content (annual)										Total = Sum(45)m =		1247.4498	(45)
Distribution loss (46)m = 0.15 x (45)m													
	19.4001	16.9674	17.5089	15.2647	14.6468	12.6391	11.7120	13.4396	13.6002	15.8497	17.3012	18.7879	(46)
Water storage loss:													
Store volume												2.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.7400	(48)
Temperature factor from Table 2b												1.0000	(49)
Enter (49) or (54) in (55)												0.7400	(55)
Total storage loss													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(56)
If cylinder contains dedicated solar storage													
	22.9400	20.7200	22.9400	22.2000	22.9400	22.2000	22.9400	22.9400	22.2000	22.9400	22.2000	22.9400	(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													
	175.5363	154.8474	162.9282	146.4764	143.8478	128.9725	124.2822	135.8001	135.3797	151.8669	160.0531	171.4553	(62)
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													
	175.5363	154.8474	162.9282	146.4764	143.8478	128.9725	124.2822	135.8001	135.3797	151.8669	160.0531	171.4553	(64)
									Total per year (kWh/year) = Sum(64)m =			1791.4458	(64)
Heat gains from water heating, kWh/month													
	79.9654	70.9961	75.7733	69.6063	69.4290	63.7862	62.9234	66.7531	65.9166	72.0954	74.1205	78.6085	(65)

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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	86.5685	86.5685	86.5685	86.5685	86.5685	86.5685	86.5685	86.5685	86.5685	86.5685	86.5685	86.5685	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	13.4501	11.9463	9.7153	7.3551	5.4981	4.6417	5.0155	6.5193	8.7503	11.1105	12.9675	13.8239	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	150.8691	152.4347	148.4896	140.0908	129.4890	119.5247	112.8679	111.3024	115.2475	123.6462	134.2481	144.2124	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.6568	31.6568	31.6568	31.6568	31.6568	31.6568	31.6568	31.6568	31.6568	31.6568	31.6568	31.6568	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-69.2548	-69.2548	-69.2548	-69.2548	-69.2548	-69.2548	-69.2548	-69.2548	-69.2548	-69.2548	-69.2548	-69.2548	(71)
Water heating gains (Table 5)													
	107.4804	105.6490	101.8458	96.6754	93.3185	88.5920	84.5745	89.7220	91.5509	96.9024	102.9451	105.6566	(72)
Total internal gains													
	320.7702	319.0005	309.0212	293.0919	277.2761	261.7289	251.4285	256.5142	264.5192	280.6296	299.1314	312.6635	(73)

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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	8.3900	46.7521	0.3700	0.8900	0.7700	89.5133	(78)
East	3.3300	19.6403	0.5600	0.6800	0.7700	17.2592	(76)
South	3.8000	46.7521	0.5600	0.6800	0.7700	46.8829	(78)

Solar gains	153.6555	257.1446	340.1513	402.6949	434.5115	424.2517	411.9743	389.2214	361.9129	281.0007	183.1963	132.0521	(83)
Total gains	474.4257	576.1451	649.1726	695.7867	711.7876	685.9806	663.4028	645.7356	626.4320	561.6303	482.3277	444.7155	(84)

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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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	54.5386	54.6534	54.7687	55.3526	55.4709	56.0698	56.0698	56.1912	55.8287	55.4709	55.2348	55.0008	
alpha	4.6359	4.6436	4.6512	4.6902	4.6981	4.7380	4.7380	4.7461	4.7219	4.6981	4.6823	4.6667	
util living area													
	0.9916	0.9793	0.9536	0.8962	0.7872	0.6163	0.4544	0.4849	0.7026	0.9133	0.9813	0.9936	(86)
MIT	19.8172	20.0444	20.3243	20.6255	20.8476	20.9640	20.9930	20.9905	20.9320	20.6427	20.1675	19.7729	(87)
Th 2	19.7714	19.7736	19.7759	19.7871	19.7894	19.8007	19.8007	19.8029	19.7961	19.7894	19.7849	19.7804	(88)
util rest of house													
	0.9886	0.9722	0.9378	0.8615	0.7209	0.5144	0.3339	0.3634	0.6052	0.8765	0.9737	0.9914	(89)
MIT 2	18.2460	18.5740	18.9707	19.3859	19.6571	19.7804	19.7986	19.7999	19.7520	19.4209	18.7628	18.1882	(90)
Living area fraction										fLA = Living area / (4) =		0.4339	(91)
MIT	18.9277	19.2119	19.5579	19.9237	20.1736	20.2939	20.3168	20.3164	20.2640	19.9510	19.3722	18.8757	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9277	19.2119	19.5579	19.9237	20.1736	20.2939	20.3168	20.3164	20.2640	19.9510	19.3722	18.8757	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9858	0.9681	0.9344	0.8659	0.7436	0.5579	0.3865	0.4164	0.6453	0.8822	0.9703	0.9890	(94)
Useful gains	467.6800	557.7437	606.5990	602.4913	529.2740	382.6784	256.3988	268.8962	404.2353	495.4900	467.9875	439.8336	(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													
	1044.7268	1020.0298	928.6975	775.7482	595.0239	395.5584	258.2108	271.4898	430.0652	656.6383	865.4502	1039.3540	(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													
	429.3228	310.6563	239.6413	124.7450	48.9179	0.0000	0.0000	0.0000	0.0000	119.8944	286.1731	446.0432	(98)
Space heating												2005.3940	(98)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Space heating per m2		(98) / (4) =	39.0154 (99)

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)			0.0000 (301)
Fraction of space heat from community system			1.0000 (302)
Fraction of heat from community Heat pump			0.4600 (303a)
Fraction of heat from community Boilers			0.5400 (303b)
Fraction of total space heat from community Heat pump			0.4600 (304a)
Fraction of total space heat from community Boilers			0.5400 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating			1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating			1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system			1.0500 (306)
Space heating:			
Annual space heating requirement			2005.3940 (98)
Space heat from Heat pump = (98) x 0.46 x 1.00 x 1.05			968.6053 (307a)
Space heat from Boilers = (98) x 0.54 x 1.00 x 1.05			1137.0584 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)			0.0000 (308)
Space heating fuel for secondary/supplementary system			0.0000 (309)
Water heating			
Annual water heating requirement			1791.4458 (64)
Water heat from Heat pump = (64) x 0.46 x 1.00 x 1.05			865.2683 (310a)
Water heat from Boilers = (64) x 0.54 x 1.00 x 1.05			1015.7498 (310b)
Electricity used for heat distribution			39.8668 (313)
Annual totals kWh/year			
Electricity for pumps and fans:			
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.2500, SFP = 0.6625)			
mechanical ventilation fans (SFP = 0.6625)			105.9373 (330a)
Total electricity for the above, kWh/year			105.9373 (331)
Electricity for lighting (calculated in Appendix L)			237.5329 (332)
Energy saving/generation technologies (Appendices M ,N and Q)			
PV Unit 0 (0.80 * 0.50 * 951 * 1.00) =		-380.2464	-380.2464 (333)
Total delivered energy for all uses			3949.9055 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			370.0000	(367a)
Space heating from Heat pump	495.6415	0.5190	257.2379	(367)
Efficiency of heat source Boilers			93.9000	(367b)
Space heating from Boilers	2292.6604	0.2160	495.2147	(368)
Electrical energy for heat distribution	39.8668	0.5190	20.6909	(372)
Total CO2 associated with community systems			773.1435	(373)
(negative value allowed since DFEE <= TFEE)				
Space and water heating			773.1435	(376)
Pumps and fans	105.9373	0.5190	54.9815	(378)
Energy for lighting	237.5329	0.5190	123.2796	(379)
Energy saving/generation technologies				
PV Unit	-380.2464	0.5190	-197.3479	(380)
Total CO2, kg/year			754.0566	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			14.6700	(384)

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

DER		14.6700	ZC1
Total Floor Area	TFA	51.4000	
Assumed number of occupants	N	1.7314	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.3934	ZC2
CO2 emissions from cooking, equation (L16)		3.1236	ZC3
Total CO2 emissions		35.1870	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		35.1870	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	51.4000 (1b)	x	2.5500 (2b)	=	131.0700	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.4000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	131.0700	(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)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1526	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.4026	(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) =	0.3724	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4748	0.4655	0.4562	0.4096	0.4003	0.3538	0.3538	0.3445	0.3724	0.4003	0.4189	0.4376	(22b)
Effective ac	0.6127	0.6083	0.6041	0.5839	0.5801	0.5626	0.5626	0.5593	0.5693	0.5801	0.5878	0.5957	(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 Semi-glazed door			2.1000	1.2000	2.5200			(26a)
TER Opening Type (Uw = 1.40)			10.7500	1.3258	14.2519			(27)
External Wall 1	57.1000	10.7500	46.3500	0.1800	8.3430			(29a)
stair wall	13.5000	2.1000	11.4000	0.1800	2.0520			(29a)
External Roof 1	51.4000		51.4000	0.1300	6.6820			(30)
Total net area of external elements Aum(A, m2)			122.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		33.8489			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	16.2370	(36)
Total fabric heat loss (33) + (36) =	50.0859	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.5020	26.3127	26.1271	25.2555	25.0924	24.3333	24.3333	24.1927	24.6257	25.0924	25.4223	25.7672	(38)
Heat transfer coeff	76.5879	76.3986	76.2130	75.3414	75.1783	74.4192	74.4192	74.2786	74.7116	75.1783	75.5082	75.8531	(39)
Average = Sum(39)m / 12 =												75.3406	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4900	1.4864	1.4827	1.4658	1.4626	1.4478	1.4478	1.4451	1.4535	1.4626	1.4690	1.4757	(40)
HLP (average)												1.4658	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.7314 (42)
Average daily hot water use (litres/day)	75.3200 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	82.8520	79.8392	76.8264	73.8136	70.8008	67.7880	67.7880	70.8008	73.8136	76.8264	79.8392	82.8520	(44)
Energy conte	122.8672	107.4604	110.8895	96.6762	92.7631	80.0475	74.1758	85.1178	86.1344	100.3813	109.5740	118.9903	(45)
Energy content (annual)										Total = Sum(45)m =		1185.0773	(45)
Distribution loss (46)m = 0.15 x (45)m	18.4301	16.1191	16.6334	14.5014	13.9145	12.0071	11.1264	12.7677	12.9202	15.0572	16.4361	17.8485	(46)

Water storage loss:	
Store volume	2.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	0.2388 (48)
Temperature factor from Table 2b	0.5400 (49)
Enter (49) or (54) in (55)	0.1290 (55)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss
3.9977 3.6109 3.9977 3.8688 3.9977 3.8688 3.9977 3.9977 3.8688 3.9977 3.8688 3.9977 (56)
If cylinder contains dedicated solar storage
3.9977 3.6109 3.9977 3.8688 3.9977 3.8688 3.9977 3.9977 3.8688 3.9977 3.8688 3.9977 (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
150.1273 132.0825 138.1497 123.0570 120.0232 106.4283 101.4359 112.3779 112.5151 127.6414 135.9548 146.2504 (62)
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
150.1273 132.0825 138.1497 123.0570 120.0232 106.4283 101.4359 112.3779 112.5151 127.6414 135.9548 146.2504 (64)
Total per year (kWh/year) = Sum(64)m = 1506.0435 (64)
Heat gains from water heating, kWh/month
62.6614 55.4282 58.6789 53.2495 52.6518 47.7204 46.4716 50.1098 49.7443 55.1849 57.5380 61.3724 (65)

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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	86.5685	86.5685	86.5685	86.5685	86.5685	86.5685	86.5685	86.5685	86.5685	86.5685	86.5685	86.5685	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
13.4909 11.9825 9.7448 7.3775 5.5147 4.6558 5.0307 6.5391 8.7768 11.1442 13.0069 13.8659 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
150.8691 152.4347 148.4896 140.0908 129.4890 119.5247 112.8679 111.3024 115.2475 123.6462 134.2481 144.2124 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
31.6568 31.6568 31.6568 31.6568 31.6568 31.6568 31.6568 31.6568 31.6568 31.6568 31.6568 31.6568 (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)
-69.2548 -69.2548 -69.2548 -69.2548 -69.2548 -69.2548 -69.2548 -69.2548 -69.2548 -69.2548 -69.2548 -69.2548 (71)
Water heating gains (Table 5)
84.2224 82.4825 78.8695 73.9576 70.7686 66.2784 62.4618 67.3518 69.0893 74.1732 79.9139 82.4898 (72)
Total internal gains
300.5530 298.8703 289.0744 273.3964 257.7429 242.4294 232.3310 237.1639 245.0842 260.9342 279.1395 292.5386 (73)

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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	2.3100	19.6403	0.6300	0.7000	0.7700	13.8654	(76)
South	8.4400	46.7521	0.6300	0.7000	0.7700	120.5910	(78)

Solar gains	134.4564	224.6206	296.2449	349.4824	376.1350	366.8741	356.4134	337.4001	314.7526	245.2035	160.2300	115.6040	(83)
Total gains	435.0094	523.4909	585.3193	622.8788	633.8779	609.3035	588.7444	574.5640	559.8368	506.1378	439.3695	408.1426	(84)

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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	46.6058	46.7213	46.8351	47.3769	47.4797	47.9640	47.9640	48.0548	47.7763	47.4797	47.2723	47.0573	
alpha	4.1071	4.1148	4.1223	4.1585	4.1653	4.1976	4.1976	4.2037	4.1851	4.1653	4.1515	4.1372	
util living area	0.9921	0.9827	0.9644	0.9244	0.8438	0.6976	0.5341	0.5656	0.7725	0.9355	0.9842	0.9939	(86)
MIT	19.5419	19.7680	20.0686	20.4198	20.7159	20.9112	20.9775	20.9710	20.8562	20.4670	19.9343	19.5017	(87)
Th 2	19.6950	19.6977	19.7005	19.7133	19.7157	19.7268	19.7268	19.7289	19.7225	19.7157	19.7108	19.7057	(88)
util rest of house	0.9894	0.9770	0.9522	0.8971	0.7855	0.5902	0.3903	0.4232	0.6776	0.9065	0.9779	0.9918	(89)
MIT 2	17.8083	18.1366	18.5682	19.0658	19.4505	19.6712	19.7195	19.7185	19.6193	19.1421	18.3891	17.7571	(90)
Living area fraction									fLA = Living area / (4) =			0.4339	(91)
MIT	18.5604	18.8444	19.2192	19.6532	19.9995	20.2092	20.2653	20.2619	20.1559	19.7169	19.0595	18.5140	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5604	18.8444	19.2192	19.6532	19.9995	20.2092	20.2653	20.2619	20.1559	19.7169	19.0595	18.5140	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9862	0.9719	0.9464	0.8956	0.8000	0.6338	0.4533	0.4854	0.7131	0.9065	0.9736	0.9890	(94)
Useful gains	428.9857	508.7947	553.9737	557.8700	507.0898	386.1825	266.8658	278.8945	399.2082	458.8118	427.7503	403.6659	(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	1092.1765	1065.3307	969.3684	810.1605	623.9452	417.4322	272.7678	286.8561	452.4491	685.3951	903.0411	1085.7582	(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	493.4140	373.9922	309.0537	181.6491	86.9404	0.0000	0.0000	0.0000	0.0000	168.5780	342.2094	507.4767	(98)
Space heating												2463.3134	(98)
Space heating per m2											(98) / (4) =	47.9244	(99)

8c. Space cooling requirement

Not applicable

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												2634.5598	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	493.4140	373.9922	309.0537	181.6491	86.9404	0.0000	0.0000	0.0000	0.0000	168.5780	342.2094	507.4767	(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)	527.7155	399.9917	330.5387	194.2772	92.9844	0.0000	0.0000	0.0000	0.0000	180.2973	365.9993	542.7558	(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	150.1273	132.0825	138.1497	123.0570	120.0232	106.4283	101.4359	112.3779	112.5151	127.6414	135.9548	146.2504	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.7550	87.4400	86.9005	85.8511	83.9705	79.8000	79.8000	79.8000	79.8000	85.5567	87.1765	87.8643	(217)
Fuel for water heating, kWh/month	171.0754	151.0550	158.9746	143.3377	142.9350	133.3688	127.1127	140.8245	140.9964	149.1892	155.9535	166.4503	(219)
Water heating fuel used												1781.2730	(219)
Annual totals kWh/year													
Space heating fuel - main system												2634.5598	(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)												238.2541	(232)
Total delivered energy for all uses												4729.0870	(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	2634.5598	0.2160	569.0649	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1781.2730	0.2160	384.7550	(264)
Space and water heating			953.8199	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	238.2541	0.5190	123.6539	(268)
Total CO2, kg/m2/year			1116.3988	(272)
Emissions per m2 for space and water heating			18.5568	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.4057	(272b)
Emissions per m2 for pumps and fans			0.7573	(272c)
Target Carbon Dioxide Emission Rate (TER) = (18.5568 * 1.00) + 2.4057 + 0.7573, rounded to 2 d.p.			21.7200	(273)

APPENDIX C1 - COMMUNITY CENTRE – PART L RESULTS "LEAN"

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

Highgate Newton Community Centre

As designed

Date: Fri Feb 07 19:06:40 2020

Administrative information

Building Details

Address: Highgate Newton Community Centre, London,

Certification tool

Calculation engine: TAS

Calculation engine version: "v9.4.4"

Interface to calculation engine: TAS

Interface to calculation engine version: v9.4.4

BRUKL compliance check version: v5.6.a.1

Owner Details

Name:

Telephone number:

Address: , ,

Certifier details

Name: Paul Bacon

Telephone number: 01908 261461

Address: 13-14 Cofferidge Close, Stony Stratford, Milton Keynes, MK11 1BY

Criterion 1: The calculated CO_2 emission rate for the building must not exceed the target

The building does not comply with England Building Regulations Part L 2013

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	16.7
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	16.7
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	17.9
Are emissions from the building less than or equal to the target?	BER > TER
Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.22	0.22	External Wall
Floor	0.25	0.14	0.18	Ground Floor Hall
Roof	0.25	0.16	0.18	Roof Hall
Windows***, roof windows, and rooflights	2.2	1.65	1.9	1F CW part 1
Personnel doors	2.2	1.7	1.74	D12
Vehicle access & similar large doors	1.5	-	-	No vehicle doors in project
High usage entrance doors	3.5	-	-	No high usage entrance doors in project

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [$W/(m^2K)$]

$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [$W/(m^2K)$]

$U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [$W/(m^2K)$]

* There might be more than one surface where the maximum U-value occurs.

** Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

*** Display windows and similar glazing are excluded from the U-value check.

N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air Permeability	Worst acceptable standard	This building
$m^3/(h.m^2)$ at 50 Pa	10	3

Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	0.9 to 0.95

1- Gym (B.0.10 Gym)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.7	5.44	-	1.22	0.83
Standard value	0.91*	2.6	N/A	1.6^	0.5
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

^ Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.

2- NV + UFH

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.94	-	-	-	-
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

3- NV + Rads

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.94	-	-	-	-
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

4- Recording Studio (B.3.06 Recording Studio)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.7	-	-	1.4	0.5
Standard value	2.5*	N/A	N/A	1.6^	0.5
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.

^ Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.

5- B.0.01 Office - UFH + Supply only (B.0.01 Office)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.94	-	-	0.51	-
Standard value	N/A	N/A	N/A	1.1^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

^ Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.

6- Extract Only Local (B.0.06 Laundrette)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0	-	-	-	-
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

7- Extract Only Central (6 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.94	-	-	-	-
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

8- Hall (2 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.94	-	-	1.8	0.73
Standard value	0.91*	N/A	N/A	1.5^	0.5
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

^ Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.

9- B.0.05 Toilets (4 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.94	-	-	0.78	0.5
Standard value	N/A	N/A	N/A	1.1^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

^ Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.

10- B.1.03 Activity room Kit (B.1.03 Activity Room)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.94	-	-	1.43	0.5
Standard value	N/A	N/A	N/A	1.1^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

^ Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.

11- B.3.02 Juice bar (B.3.02 Juice Bar)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0	-	-	1.43	0.8
Standard value	N/A	N/A	N/A	1.1^	0.5
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

^ Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.

12- GF meeting rooms (3 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.94	-	-	1.4	0.5
Standard value	N/A	N/A	N/A	1.1^	0.5
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

^ Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.

13- Kitchen (B.0.07 Kitchen)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.94	-	-	0.78	-
Standard value	0.91*	N/A	N/A	1.1^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

^ Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.

14- plantroom (LG_Plantroom)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0	-	-	1.39	0.7
Standard value	N/A	N/A	N/A	1.1^	0.5
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

^ Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.

15- kiln room (B.1.04 Activity Room)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.94	-	-	0.97	0.7
Standard value	N/A	N/A	N/A	1.1^	0.5
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

^ Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.

1- New HWS Circuit

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	0.94	0
Standard value	N/A	N/A

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
A	Local supply or extract ventilation units serving a single area
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
H	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
B.0.06 Laundrette	0.4	-	-	-	-	-	-	-	-	-	N/A
B.1.06 WC	-	-	0.5	-	-	-	-	-	-	-	N/A
B.1.05 Dis WC	-	-	0.3	-	-	-	-	-	-	-	N/A
B.2.06 Dis WC	-	-	0.5	-	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
B.2.07 WC	-	-	0.5	-	-	-	-	-	-	-	N/A
B.3.09 WC	-	-	0.5	-	-	-	-	-	-	-	N/A
B.3.08 Dis WC	-	-	0.5	-	-	-	-	-	-	-	N/A

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
Hall A	-	60	-	632
B.0.01 Office	60	-	-	164
B.0.02 Cafe Seating	-	60	-	132
B.0.03 Seating	-	60	-	180
B.0.05 Toilets - Lobby	-	60	-	48
B.0.05 Toilets - Dis WC	-	60	-	46
B.0.05 Toilets - WCs	-	60	-	101
B.0.05 Toilets - Serperate WC	-	60	-	25
B.0.06 Laundrette	-	60	-	60
B.0.07 Kitchen	-	60	-	175
B.0.08 Servery	-	60	-	276
B.0.0X Stairs 1	-	60	-	104
B.0.0X Stairs 2	-	60	-	187
B.0.0X Second entrance	-	60	-	47
B.0.0X Entrance Circ A	-	60	-	533
B.0.09 Main Hall Store	60	-	-	58
B.0.10 Gym	-	60	-	387
B.0.10 Gym WC	-	60	-	35
B.1.01 Office	60	-	-	348
B.1.02 Office	60	-	-	305
B.1.03 Activity Room	60	-	-	788
B.1.04 Activity Room	60	-	-	710
B.1.0X Stair 1	-	60	-	317
B.1.0X Stair 2	-	60	-	212
B.1.07 Circulation	-	60	-	124
B.1.06 WC	-	60	-	39
B.1.05 Dis WC	-	60	-	47
B.1.08 Store	60	-	-	8
B.2.01 Activity Room	60	-	-	329
B.2.02 Activity Room	60	-	-	361
B.2.03 Activity Room	60	-	-	634
B.2.04 Activity Room	60	-	-	570
B.2.05 Office	60	-	-	332
B.2.08 Circulation	-	60	-	109
B.2.0X Stairs 1	-	60	-	312
B.2.0X Stairs 2	-	60	-	212

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
B.2.06 Dis WC	-	60	-	47
B.2.07 WC	-	60	-	39
B.2.09 Store	60	-	-	8
B.3.01 Activity Space	60	-	-	750
B.3.02 Juice Bar	-	60	-	216
B.3.03 Office	60	-	-	458
B.3.04 1 to 1	60	-	-	131
B.3.05 Large 1 to 1	60	-	-	158
B.3.06 Recording Studio	60	-	-	182
B.3.07 Open Plan Classroom	-	60	-	241
B.3.0X Stairs 1	-	60	-	313
B.3.0X Stairs 2	-	60	-	212
B.3.09 WC	-	60	-	39
B.3.08 Dis WC	-	60	-	47
B.3.12 Circulation	-	60	-	169
B.3.02 Juice Bar - Seating area	-	60	-	43
B.0.0X Entrance Circ B	-	60	-	196
Hall B	-	60	-	1589
B.0.18 Cleaners	60	-	-	18
B.0.21 Activity room 1	60	-	-	168
B.0.22 Activity room 2	60	-	-	175
B.0.23 Activity room 3	60	-	-	150
B.3.13 Store	60	-	-	8
LG_Plantroom	60	-	-	514
LG_Corridor	-	60	-	107

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Hall A	YES (+1%)	NO
B.0.01 Office	NO (-99%)	NO
B.0.02 Cafe Seating	NO (-38%)	NO
B.0.10 Gym	NO (-23%)	NO
B.1.01 Office	NO (-68%)	NO
B.1.02 Office	NO (-76%)	NO
B.1.03 Activity Room	NO (-73%)	NO
B.1.04 Activity Room	NO (-89%)	NO
B.2.01 Activity Room	NO (-82%)	NO
B.2.02 Activity Room	NO (-86%)	NO
B.2.03 Activity Room	NO (-79%)	NO
B.2.04 Activity Room	NO (-85%)	NO
B.2.05 Office	NO (-67%)	NO
B.3.01 Activity Space	NO (-78%)	NO
B.3.03 Office	NO (-85%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
B.3.04 1 to 1	NO (-73%)	NO
B.3.05 Large 1 to 1	NO (-79%)	NO
B.3.06 Recording Studio	N/A	N/A
B.3.07 Open Plan Classroom	NO (-77%)	NO
B.3.02 Juice Bar - Seating area	NO (-95%)	NO
Hall B	NO (-76%)	NO
B.0.21 Activity room 1	NO (-48%)	NO
B.0.22 Activity room 2	NO (-51%)	NO
B.0.23 Activity room 3	NO (-39%)	NO

Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m^2]	1688	1688
External area [m^2]	3018	3018
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	3	4
Average conductance [W/K]	952	1181
Average U-value [W/m^2K]	0.32	0.39
Alpha value* [%]	21.53	21.53

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area	Building Type
	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
	B1 Offices and Workshop businesses
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
	C1 Hotels
	C2 Residential Institutions: Hospitals and Care Homes
	C2 Residential Institutions: Residential schools
	C2 Residential Institutions: Universities and colleges
	C2A Secure Residential Institutions
	Residential spaces
100	**D1 Non-residential Institutions: Community/Day Centre**
	D1 Non-residential Institutions: Libraries, Museums, and Galleries
	D1 Non-residential Institutions: Education
	D1 Non-residential Institutions: Primary Health Care Building
	D1 Non-residential Institutions: Crown and County Courts
	D2 General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger terminals
	Others: Emergency services
	Others: Miscellaneous 24hr activities
	Others: Car Parks 24 hrs
	Others: Stand alone utility block

Energy Consumption by End Use [kWh/m^2]

	Actual	Notional
Heating	7.31	12.88
Cooling	0.03	0.01
Auxiliary	1.83	2.05
Lighting	18.52	14.14
Hot water	26.86	26.26
Equipment*	28.18	28.18
TOTAL**	**54.55**	**55.33**

* Energy used by equipment does not count towards the total for consumption or calculating emissions.
** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m^2]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	25.49	40.93
Primary energy* [kWh/m^2]	103.66	96.32
Total emissions [kg/m^2]	17.9	16.7

* Primary energy is net of any electrical energy displaced by CHP generators, if applicable.

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Split or multi-split system, [HS] LTHW boiler, [HFT] Electricity, [CFT] Electricity										
	Actual	4.8	19.9	0.3	1	1.6	4.7	5.44	4.7	5.44
	Notional	12.7	4.1	1.5	0.3	1.2	2.43	3.6	----	----
[ST] Central heating using water: floor heating, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	28.5	0	8.9	0	1	0.89	0	0.94	0
	Notional	64.2	0	21.8	0	1.1	0.82	0	----	----
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	39.3	0	12.2	0	1.1	0.89	0	0.94	0
	Notional	48.2	0	16.4	0	1.1	0.82	0	----	----
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	0.5	0	0	0	3.2	4.7	0	4.7	0
	Notional	8.6	0	1	0	2.1	2.43	0	----	----
[ST] Central heating using water: floor heating, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	27.9	0	8.7	0	2.8	0.89	0	0.94	0
	Notional	22.8	0	7.7	0	6.3	0.82	0	----	----
[ST] Central heating using water: floor heating, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	0	0	0	0	18.9	0	0	0	0
	Notional	0	0	0	0	18.1	0	0	----	----
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	16.8	0	5.2	0	9.1	0.89	0	0.94	0
	Notional	22.9	0	7.8	0	11.3	0.82	0	----	----
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	23.1	0	7.2	0	3.2	0.89	0	0.94	0
	Notional	63	0	20.3	0	3.6	0.86	0	----	----
[ST] Central heating using water: floor heating, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	8	0	2.5	0	4.9	0.89	0	0.94	0
	Notional	3.4	0	1.2	0	9.5	0.82	0	----	----
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	0.1	0	0	0	4.3	0.89	0	0.94	0
	Notional	0.5	0	0.2	0	3.9	0.82	0	----	----
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	0	0	0	0	8.2	0	0	0	0
	Notional	0	0	0	0	6.5	0	0	----	----
[ST] Central heating using water: floor heating, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	39.7	0	12.4	0	5.9	0.89	0	0.94	0
	Notional	20.5	0	6.9	0	7.4	0.82	0	----	----
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	0.1	0	0	0	4.7	0.89	0	0.94	0
	Notional	0	0	0	0	6.5	0	0	----	----
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	0.1	0	0	0	3.3	0.89	0	0.94	0
	Notional	1.4	0	0.5	0	4.6	0.82	0	----	----

Key to terms

Heat dem [MJ/m2]	= Heating energy demand
Cool dem [MJ/m2]	= Cooling energy demand
Heat con [kWh/m2]	= Heating energy consumption
Cool con [kWh/m2]	= Cooling energy consumption
Aux con [kWh/m2]	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type

Key Features

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

Building fabric

Element	$U_{i\text{-}Typ}$	$U_{i\text{-}Min}$	Surface where the minimum value occurs*
Wall	0.23	0.22	External Wall
Floor	0.2	0.11	Ground Floor
Roof	0.15	0.14	Roof
Windows, roof windows, and rooflights	1.5	1.5	Curtain wall
Personnel doors	1.5	1.59	Gym Door
Vehicle access & similar large doors	1.5	-	No vehicle doors in project
High usage entrance doors	1.5	-	No high usage entrance doors in project

$U_{i\text{-}Typ}$ = Typical individual element U-values [W/(m²K)] $U_{i\text{-}Min}$ = Minimum individual element U-values [W/(m²K)]

* There might be more than one surface where the minimum U-value occurs.

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	3

APPENDIX C2 - COMMUNITY CENTRE – PART L RESULTS "GREEN"

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

Highgate Newton Community Centre

As designed

Date: Fri Feb 07 18:51:59 2020

Administrative information

Building Details

Address: Highgate Newton Community Centre, London,

Certification tool

Calculation engine: TAS

Calculation engine version: "v9.4.4"

Interface to calculation engine: TAS

Interface to calculation engine version: v9.4.4

BRUKL compliance check version: v5.6.a.1

Owner Details

Name:

Telephone number:

Address: , ,

Certifier details

Name:

Telephone number:

Address: , ,

Criterion 1: The calculated CO_2 emission rate for the building must not exceed the target

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	15.9
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	15.9
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	12
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.22	0.22	External Wall
Floor	0.25	0.14	0.18	Ground Floor Hall
Roof	0.25	0.16	0.18	Roof Hall
Windows***, roof windows, and rooflights	2.2	1.65	1.9	1F CW part 1
Personnel doors	2.2	1.72	1.74	D12
Vehicle access & similar large doors	1.5	-	-	No vehicle doors in project
High usage entrance doors	3.5	-	-	No high usage entrance doors in project

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [$W/(m^2K)$]

$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [$W/(m^2K)$]

$U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [$W/(m^2K)$]

* There might be more than one surface where the maximum U-value occurs.

** Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

*** Display windows and similar glazing are excluded from the U-value check.

N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air Permeability	Worst acceptable standard	This building
$m^3/(h.m^2)$ at 50 Pa	10	3.1

Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	0.9 to 0.95

1- Gym (B.0.10 Gym)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.7	5.44	-	1.22	0.83
Standard value	N/A	2.6	N/A	1.6^	0.5
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
^ Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.					

2- NV + UFH

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1.43	-	-	-	-
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

3- NV + Rads

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1.43	-	-	-	-
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

4- Recording Studio (B.3.06 Recording Studio)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.7	-	-	1.4	0.5
Standard value	2.5*	N/A	N/A	1.6^	0.5
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.					
^ Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.					

5- B.0.01 Office - UFH + Supply only (B.0.01 Office)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1.43	-	-	0.51	-
Standard value	N/A	N/A	N/A	1.1^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
^ Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.					

6- Kitchen (B.0.07 Kitchen)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1.43	-	-	0.78	-
Standard value	N/A	N/A	N/A	1.1^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
^ Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.					

7- Extract Only Local (B.0.06 Laundrette)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0	-	-	-	-
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

8- Extract Only Central (6 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1.43	-	-	-	-
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

9- Hall (2 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1.43	-	-	1.8	0.73
Standard value	N/A	N/A	N/A	1.5^	0.5
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
^ Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.					

10- B.0.05 Toilets (4 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1.43	-	-	0.78	0.5
Standard value	N/A	N/A	N/A	1.1^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
^ Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.					

11- B.1.03 Activity room Kit (B.1.03 Activity Room)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1.43	-	-	1.43	0.5
Standard value	N/A	N/A	N/A	1.1^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
^ Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.					

12- B.3.02 Juice bar (B.3.02 Juice Bar)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0	-	-	1.43	0.8
Standard value	N/A	N/A	N/A	1.1^	0.5
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
^ Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.					

13- GF meeting rooms (3 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1.43	-	-	1.4	0.7
Standard value	N/A	N/A	N/A	1.1^	0.5
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
^ Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.					

14- B1.04 Kiln room (B.1.04 Activity Room)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1.43	-	-	0.97	0.7
Standard value	N/A	N/A	N/A	1.1^	0.5
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

^ Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.

1- New HWS Circuit

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1.43	0
Standard value	N/A	N/A

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
A	Local supply or extract ventilation units serving a single area
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
H	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
B.0.06 Laundrette	0.4	-	-	-	-	-	-	-	-	-	N/A
B.1.06 WC	-	-	0.5	-	-	-	-	-	-	-	N/A
B.1.05 Dis WC	-	-	0.3	-	-	-	-	-	-	-	N/A
B.2.06 Dis WC	-	-	0.5	-	-	-	-	-	-	-	N/A
B.2.07 WC	-	-	0.5	-	-	-	-	-	-	-	N/A
B.3.09 WC	-	-	0.5	-	-	-	-	-	-	-	N/A
B.3.08 Dis WC	-	-	0.5	-	-	-	-	-	-	-	N/A

General lighting and display lighting

Zone name	Luminous efficacy [lm/W]			General lighting [W]
	Luminaire	Lamp	Display lamp	
Standard value	60	60	22	
Hall A	-	-	-	448
B.0.01 Office	-	-	-	94
B.0.02 Cafe Seating	-	100	-	79
B.0.03 Seating	-	100	-	108
B.0.05 Toilets - Lobby	-	100	-	29
B.0.05 Toilets - Dis WC	-	100	-	27
B.0.05 Toilets - WCs	-	100	-	61
B.0.05 Toilets - Serperate WC	-	100	-	15
B.0.06 Laundrette	-	-	-	22

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
B.0.07 Kitchen	-	100	-	105
B.0.08 Servery	-	100	-	165
B.0.0X Stairs 1	-	100	-	62
B.0.0X Stairs 2	-	100	-	112
B.0.0X Second entrance	-	-	-	72
B.0.0X Entrance Circ A	-	-	-	502
B.0.09 Main Hall Store	100	-	-	35
B.0.10 Gym	-	-	-	305
B.0.10 Gym WC	-	100	-	21
B.1.01 Office	-	-	-	169
B.1.02 Office	-	-	-	176
B.1.03 Activity Room	-	-	-	368
B.1.04 Activity Room	-	-	-	316
B.1.0X Stair 1	-	100	-	190
B.1.0X Stair 2	-	100	-	127
B.1.07 Circulation	-	100	-	50
B.1.06 WC	-	100	-	23
B.1.05 Dis WC	-	100	-	28
B.1.08 Store	-	-	-	15
B.2.01 Activity Room	-	-	-	42
B.2.02 Activity Room	-	-	-	41
B.2.03 Activity Room	-	-	-	74
B.2.04 Activity Room	-	-	-	63
B.2.05 Office	-	-	-	196
B.2.08 Circulation	-	100	-	43
B.2.0X Stairs 1	-	100	-	187
B.2.0X Stairs 2	-	100	-	127
B.2.06 Dis WC	-	100	-	28
B.2.07 WC	-	100	-	23
B.2.09 Store	-	-	-	15
B.3.01 Activity Space	-	-	-	326
B.3.02 Juice Bar	-	-	-	91
B.3.03 Office	-	-	-	250
B.3.04 1 to 1	-	-	-	89
B.3.05 Large 1 to 1	-	-	-	134
B.3.06 Recording Studio	-	-	-	90
B.3.07 Open Plan Classroom	-	-	-	170
B.3.0X Stairs 1	-	100	-	188
B.3.0X Stairs 2	-	100	-	127
B.3.09 WC	-	100	-	23
B.3.08 Dis WC	-	100	-	28
B.3.12 Circulation	-	100	-	68
B.3.02 Juice Bar - Seating area	-	-	-	65

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
B.0.0X Entrance Circ B	-	-	-	135
Hall B	-	-	-	1136
B.0.18 Cleaners	-	-	-	49
B.0.21 Activity room 1	100	-	-	101
B.0.22 Activity room 2	100	-	-	105
B.0.23 Activity room 3	100	-	-	90
B.3.13 Store	100	-	-	5
LG_Plantroom	100	-	-	308
LG_Corridor	-	100	-	64

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Hall A	YES (+1%)	NO
B.0.01 Office	NO (-99%)	NO
B.0.02 Cafe Seating	NO (-38%)	NO
B.0.10 Gym	NO (-23%)	NO
B.1.01 Office	NO (-68%)	NO
B.1.02 Office	NO (-76%)	NO
B.1.03 Activity Room	NO (-73%)	NO
B.1.04 Activity Room	NO (-89%)	NO
B.2.01 Activity Room	NO (-82%)	NO
B.2.02 Activity Room	NO (-86%)	NO
B.2.03 Activity Room	NO (-79%)	NO
B.2.04 Activity Room	NO (-85%)	NO
B.2.05 Office	NO (-67%)	NO
B.3.01 Activity Space	NO (-78%)	NO
B.3.03 Office	NO (-85%)	NO
B.3.04 1 to 1	NO (-73%)	NO
B.3.05 Large 1 to 1	NO (-79%)	NO
B.3.06 Recording Studio	N/A	N/A
B.3.07 Open Plan Classroom	NO (-77%)	NO
B.3.02 Juice Bar - Seating area	NO (-95%)	NO
Hall B	NO (-76%)	NO
B.0.21 Activity room 1	NO (-48%)	NO
B.0.22 Activity room 2	NO (-51%)	NO
B.0.23 Activity room 3	NO (-39%)	NO

Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m^2]	1688	1688
External area [m^2]	3018	3018
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	3	4
Average conductance [W/K]	952	1182
Average U-value [W/m^2K]	0.32	0.39
Alpha value* [%]	21.53	21.53

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area	Building Type
	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
	B1 Offices and Workshop businesses
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
	C1 Hotels
	C2 Residential Institutions: Hospitals and Care Homes
	C2 Residential Institutions: Residential schools
	C2 Residential Institutions: Universities and colleges
	C2A Secure Residential Institutions
	Residential spaces
100	**D1 Non-residential Institutions: Community/Day Centre**
	D1 Non-residential Institutions: Libraries, Museums, and Galleries
	D1 Non-residential Institutions: Education
	D1 Non-residential Institutions: Primary Health Care Building
	D1 Non-residential Institutions: Crown and County Courts
	D2 General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger terminals
	Others: Emergency services
	Others: Miscellaneous 24hr activities
	Others: Car Parks 24 hrs
	Others: Stand alone utility block

Energy Consumption by End Use [kWh/m^2]

	Actual	Notional
Heating	6.07	9.21
Cooling	0.03	0.01
Auxiliary	1.83	2.05
Lighting	11.69	14.11
Hot water	17.64	18.25
Equipment*	28.18	28.18
TOTAL**	**37.26**	**43.62**

* Energy used by equipment does not count towards the total for consumption or calculating emissions.
** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m^2]

	Actual	Notional
Photovoltaic systems	2.65	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	32	41.87
Primary energy* [kWh/m^2]	77.79	92.85
Total emissions [kg/m^2]	12	15.9

* Primary energy is net of any electrical energy displaced by CHP generators, if applicable.

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Split or multi-split system, [HS] LTHW boiler, [HFT] Electricity, [CFT] Electricity										
	Actual	5.7	19.5	0.3	1	1.6	4.7	5.44	4.7	5.44
	Notional	12.7	4.1	1.5	0.3	1.2	2.43	3.6	----	----
[ST] Central heating using water: floor heating, [HS] LTHW boiler, [HFT] Electricity, [CFT] Electricity										
	Actual	32.9	0	6.7	0	1	1.36	0	1.43	0
	Notional	67.6	0	15.9	0	1.1	1.18	0	----	----
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Electricity, [CFT] Electricity										
	Actual	51.9	0	10.6	0	1.1	1.36	0	1.43	0
	Notional	48.7	0	11.5	0	1.1	1.18	0	----	----
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	1	0	0.1	0	3.2	4.7	0	4.7	0
	Notional	8.4	0	1	0	2.1	2.43	0	----	----
[ST] Central heating using water: floor heating, [HS] LTHW boiler, [HFT] Electricity, [CFT] Electricity										
	Actual	49.8	0	10.2	0	2.8	1.36	0	1.43	0
	Notional	25.9	0	6.1	0	6.3	1.18	0	----	----
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Electricity, [CFT] Electricity										
	Actual	0.6	0	0.1	0	4.7	1.36	0	1.43	0
	Notional	0	0	0	0	6.5	0	0	----	----
[ST] Central heating using water: floor heating, [HS] LTHW boiler, [HFT] Electricity, [CFT] Electricity										
	Actual	0	0	0	0	18.9	0	0	0	0
	Notional	0	0	0	0	18.1	0	0	----	----
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Electricity, [CFT] Electricity										
	Actual	22.8	0	4.7	0	9.1	1.36	0	1.43	0
	Notional	23.9	0	5.6	0	11.3	1.18	0	----	----
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Electricity, [CFT] Electricity										
	Actual	26	0	5.3	0	3.2	1.36	0	1.43	0
	Notional	63.2	0	14.3	0	3.6	1.22	0	----	----
[ST] Central heating using water: floor heating, [HS] LTHW boiler, [HFT] Electricity, [CFT] Electricity										
	Actual	19.2	0	3.9	0	4.9	1.36	0	1.43	0
	Notional	7.1	0	1.7	0	9.5	1.18	0	----	----
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Electricity, [CFT] Electricity										
	Actual	0.3	0	0.1	0	4.3	1.36	0	1.43	0
	Notional	0.6	0	0.2	0	3.9	1.18	0	----	----
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Electricity, [CFT] Electricity										
	Actual	0	0	0	0	8.2	0	0	0	0
	Notional	0	0	0	0	6.5	0	0	----	----
[ST] Central heating using water: floor heating, [HS] LTHW boiler, [HFT] Electricity, [CFT] Electricity										
	Actual	46.5	0	9.5	0	5.9	1.36	0	1.43	0
	Notional	24.6	0	5.8	0	7.4	1.18	0	----	----
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Electricity, [CFT] Electricity										
	Actual	0.4	0	0.1	0	3.3	1.36	0	1.43	0
	Notional	1.5	0	0.4	0	4.6	1.18	0	----	----

Key to terms

Heat dem [MJ/m2]	= Heating energy demand
Cool dem [MJ/m2]	= Cooling energy demand
Heat con [kWh/m2]	= Heating energy consumption
Cool con [kWh/m2]	= Cooling energy consumption
Aux con [kWh/m2]	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type

Key Features

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

Building fabric

Element	$U_{i\text{-}Typ}$	$U_{i\text{-}Min}$	Surface where the minimum value occurs*
Wall	0.23	0.22	External Wall
Floor	0.2	0.11	Ground Floor
Roof	0.15	0.14	Roof
Windows, roof windows, and rooflights	1.5	1.5	Curtain wall
Personnel doors	1.5	1.59	Gym Door
Vehicle access & similar large doors	1.5	-	No vehicle doors in project
High usage entrance doors	1.5	-	No high usage entrance doors in project

$U_{i\text{-}Typ}$ = Typical individual element U-values [W/(m²K)] $U_{i\text{-}Min}$ = Minimum individual element U-values [W/(m²K)]

* There might be more than one surface where the minimum U-value occurs.

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	3.1

APPENDIX D – TM52 & TM59 RESULTS

Document

Overheating risk and TM52 Assessment

Project

Highgate Newton Residential and Community Centre

Client

London Borough of Camden

Date

February 2020

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Suitability	Revision	Version Date	Summary of Changes	Changes marked
S2	P1	14.02.19	Issue for information	

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This document requires the following approvals.

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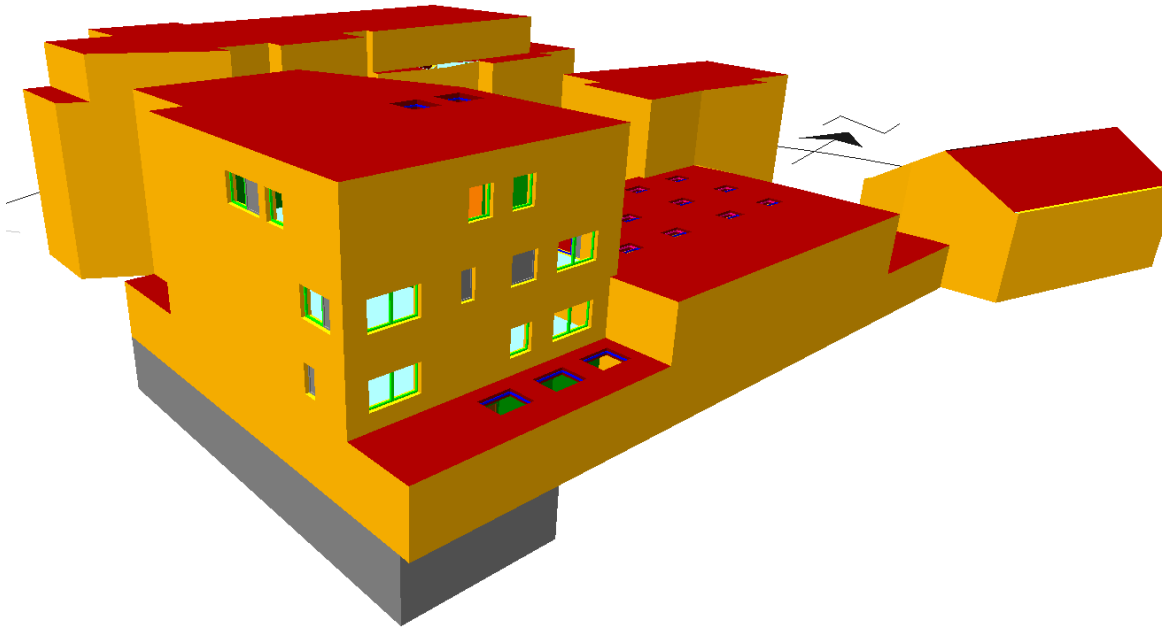
CONTENTS

1.0 INTRODUCTION



1.1 TM52 Methodology

The CIBSE TM52 assessment follows the methodology and recommendations of BS EN 15251 (BSI, 2007) to determine whether an existing occupied building can be classed as overheating or a proposed building is in danger of becoming overheated.

The following three criteria, taken together, provide a robust yet balanced assessment of the risk of overheating of buildings in the UK and Europe. A room or building that fails any two of the three criteria is classed as overheating.

Criterion 1: Hours of exceedance (He)

Sets a limit for the number of hours that the operative temperature can exceed the threshold comfort temperature (upper limit of the range of comfort temperature) by 1 K or more during the occupied hours of a typical non-heating season (1 May to 30 September).

Criterion 2: Daily weighted exceedance (We)

This criterion deals with the severity of overheating within any one day, which can be as important as its frequency, the level of which is a function of both temperature rise and its duration. This criterion sets a daily limit for acceptability.

Criterion 3: Upper limit temperature (Tupp)

Sets an absolute maximum daily temperature for a room, beyond which the level of overheating is unacceptable

It is recommended that TM52 is read in conjunction with this report for calculation methodology and further clarification.

A TM52 analysis must be performed using the CIBSE Design Summer Year weather data; the **London** DSY weather file was used in this assessment. The period of assessment is from 1st May to 30th September.

1.2 Software

A dynamic thermal model of the building has been created using Tas software, which has been used to assess the dynamic response of the building. The simulation uses hourly time steps and can cover the whole year.

EDSL TAS is AM11 compliant.

2.0 RESULTS

2.1 TM52 Results

Zone Name	Occupied Summer Hours	Max. Exceedable Hours	Criterion 1: #Hours Exceeding Comfort Range	Criterion 2: Peak Daily Weighted Exceedance	Criterion 3: #Hours Exceeding Absolute Limit	Result
B.0.01 Office	1280	38	0	0.0	0	Pass
B.0.02 Cafe Seating	1530	45	6	4.0	0	Pass
B.0.21 Activity room 1	1530	45	35	20.0	0	Pass
B.0.22 Activity room 2	1530	45	37	20.0	0	Pass
B.0.23 Activity room 3	1530	45	23	15.0	0	Pass
B.1.01 Office	1280	38	13	6.0	0	Pass
B.1.02 Office	1280	38	13	6.0	0	Pass
B.1.03 Activity Room	1530	45	5	3.0	0	Pass
B.1.04 Activity Room	1530	45	11	5.0	0	Pass
B.2.01 Activity Room	1530	45	8	4.0	0	Pass
B.2.02 Activity Room	1530	45	23	8.0	0	Pass
B.2.03 Activity Room	1530	45	22	19.0	0	Pass
B.2.04 Activity Room	1530	45	27	19.0	0	Pass
B.2.05 Office	1280	38	17	7.0	0	Pass
B.3.01 Activity Space	1530	45	15	10.0	0	Pass
B.3.02 Juice Bar	1530	45	19	13.0	0	Pass
B.3.03 Office	1280	38	4	4.0	0	Pass
B.3.04 1 to 1	1530	45	21	7.0	0	Pass
B.3.05 Large 1 to 1	1530	45	17	6.0	0	Pass
B.3.07 Open Plan Classroom	1530	45	20	11.0	0	Pass
B.3.02 Juice Bar - Seating area	1530	45	21	13.0	0	Pass

Please see results in Appendix 3.

3.0 INPUT DATA & ASSUMPTIONS

3.1 Constructions

Constructions have been modelled within the data provided by the client and are as follows:

External Wall, U Value = 0.22 W/m²K:

Layer	M-Code	Width (mm)	Conductivity (W/m.K)	Density (kg/m³)	Specific Heat (J/kg.K)	Description
Inner	am1plast\1	25.0	0.079	400	837	LIGHTWEIGHT PLASTER 1 *4
2	am1ins\2	140.0	0.045	25	1000	GLASS FIBRE 2 *3
3	Cement bonded particle board	18.0	0.230	1100	1000	
4	am1ins\2	40.0	0.045	25	1000	GLASS FIBRE 2 *3
5	am1cav\5	50.0	0.000	0	0	50MM AIR (Horizontal flow OP)
6	am1brick\1	105.0	0.700	1700	800	BRICKWORK *4

Ground Floor, U Value = 0.11 W/m²K

Layer	M-Code	Width (mm)	Conductivity (W/m.K)	Density (kg/m³)	Specific Heat (J/kg.K)	Description
Inner	am1fin\3	3.0	0.060	186	1360	CARPET *2
2	Flooring screed	50.0	0.410	1200	1000	Flooring screed. 50mm is a ty
3	PUR, 75 mm, 3in	210.0	0.025	30	1800	Polyurethane, 3 Inch
4	Concrete roof/floor slab	300.0	1.350	2000	1000	Cast concrete
5	Stone chippings	25.0	2.000	2000	1000	
6	Notional/Reference Soil	1000.0	1.500	1250	2500	

**Not included in U value calculation*

Roof Building B, U Value = 0.14 W/m²K

Layer	M-Code	Width (mm)	Conductivity (W/m.K)	Density (kg/m³)	Specific Heat (J/kg.K)	Description
Inner	Concrete Deck	300.0	2.000	2400	1000	
2	Screed	50.0	1.150	1800	1000	
3	Insulation 1	160.0	0.025	40	1450	
4	membrane	1.0	1.000	1100	1000	

Internal Floor, U Value = 0.875 W/m²K

Layer	M-Code	Width (mm)	Conductivity (W/m.K)	Density (kg/m³)	Specific Heat (J/kg.K)	Description
Inner	Reinforced concrete	300.0	2.300	2300	1000	
2	Air, 50mm ceiling	50.0	0.010	0	0	Upward flow
3	Insulation 1	15.0	0.025	40	1450	
4	am1fin\3	3.0	0.060	186	1360	CARPET *2

Internal Wall, U Value = 1.78 W/m²K

Layer	M-Code	Width (mm)	Conductivity (W/m.K)	Density (kg/m³)	Specific Heat (J/kg.K)	Description
Inner	Plasterboard	12.5	0.210	700	1000	
2	Air, 50mm wall	50.0	0.010	0	0	Horizontal flow
3	Plasterboard	12.5	0.210	700	1000	

Metal Doors & Louvres, U Value = 1.49 W/m²K

Layer	M-Code	Width (mm)	Conductivity (W/m.K)	Density (kg/m³)	Specific Heat (J/kg.K)	Description
Inner	Steel	0.6	60.000	7800	450	
2	Insulation 5	20.0	0.040	20	1030	
3	Steel	0.6	60.000	7800	450	

Glazing:

All glazing has the following specifications:

Glazing without blind, U = 1.4 Wm2K								
Light		Solar Energy (EN410)				Pilkington Shading Coefficients		
Transmittance	Reflectance	Direct Transmittance	Direct Reflectance	Direct Absorptance	Total Transmittance (G-Value)	Short Wavelength	Long Wavelength	Total
0.49	0.12	0.19	0.13	0.67	0.32	0.22	0.15	0.37

All frames are aluminium with U value of 2.2 W/m²K

3.2 Internal Conditions

Internal gains have been provided by the client and can be found in the appendices.

Occupancy gains of 57W sensible gain per person and 43W latent gain per person have been used as specified by the client.

The GF Café seating area has been modelled with 30 occupants from 12pm-1pm and 20 occupants at all other times between 8am-6pm.

All spaces have been modelled as occupied from 8am-6pm. The space 2.05 Office has no occupancy, equipment or lighting gains modelled from 12:00 – 14:00 to allow for a lunch break.

The community centre has been modelled as open on weekdays and weekends throughout the whole year.

No heating has been included in the summertime assessment.

3.3 Natural Ventilation

Openable side lit windows have been modelled as openable to 45° from 8am-6pm, windows begin to open when the adjacent space reaches 18°C and are fully open when it reaches 19°C.

The rooflights above the GF activity room have all been modelled as openable up to a maximum openable area of 50%.

The Stairwell rooflights have been modelled as openable to a maximum openable area of 2.28m^2 as specified by the client.

A number of spaces have louvres serving them, these have been modelled with a coefficient of discharge of 0.3 and openable areas as specified by the client. These are openable at all times, begin to open when the adjacent space reaches 18°C and are fully open when it reaches 19°C.

Night ventilation has been included, side lit windows are openable to 10% outside of occupied hours and rooflights to 20%, the temperature control for the night ventilation has been modelled the same as for occupied hours (18-19°C). Louvres have been modelled as openable at all times of the year.

There are a number of internal transfer grilles between perimeter spaces and the central spaces, the locations of these can be seen drawn on the floor plans shown in the appendices. Each grille has an openable area of 0.375m^2 and a coefficient of discharge of 0.3.

The GF entrance doors have been modelled as openable with the same controls logic as the side lit windows however these can be full opened.

3.4 Mechanical Ventilation

Mechanical ventilation has been included in the GF 0.01 Office and GF 0.02 Café seating area spaces at rates of 6ach and 3ach respectively. This has been modelled as fully on during all occupied hours.
All Mechanically ventilated air provided is at outside air conditions in the thermal model.

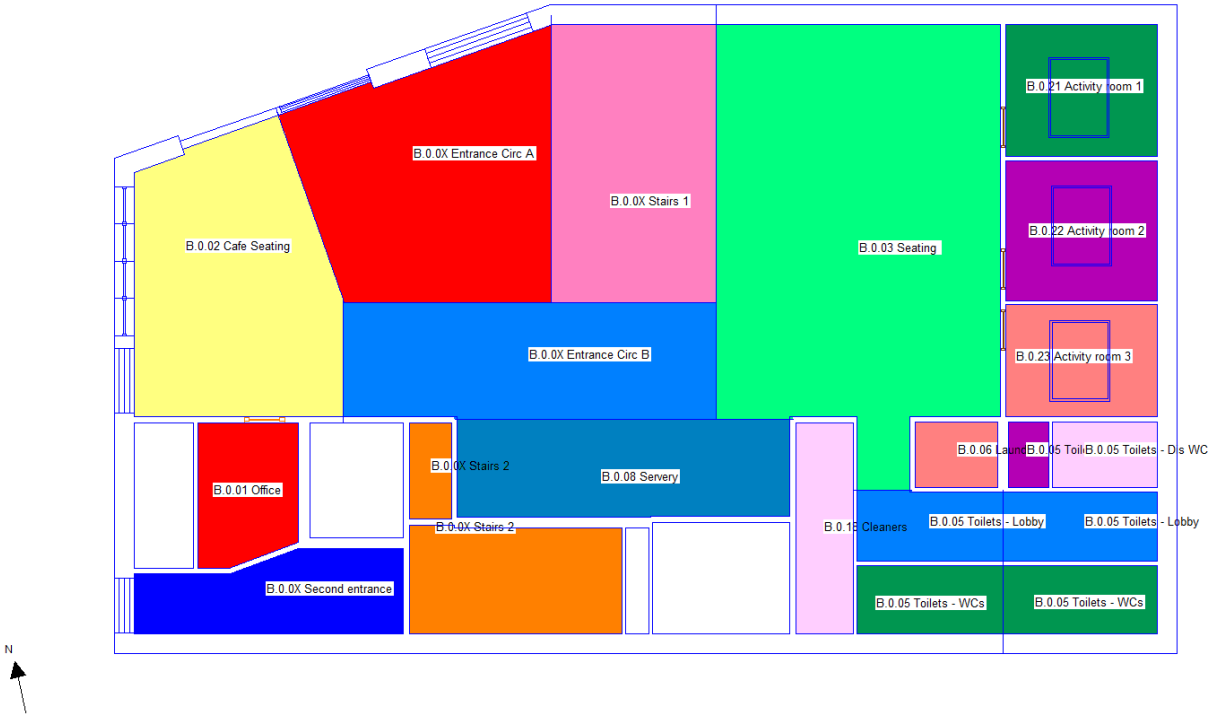
3.5 Shading

No feature shading has been accounted for other than the adjacent buildings.

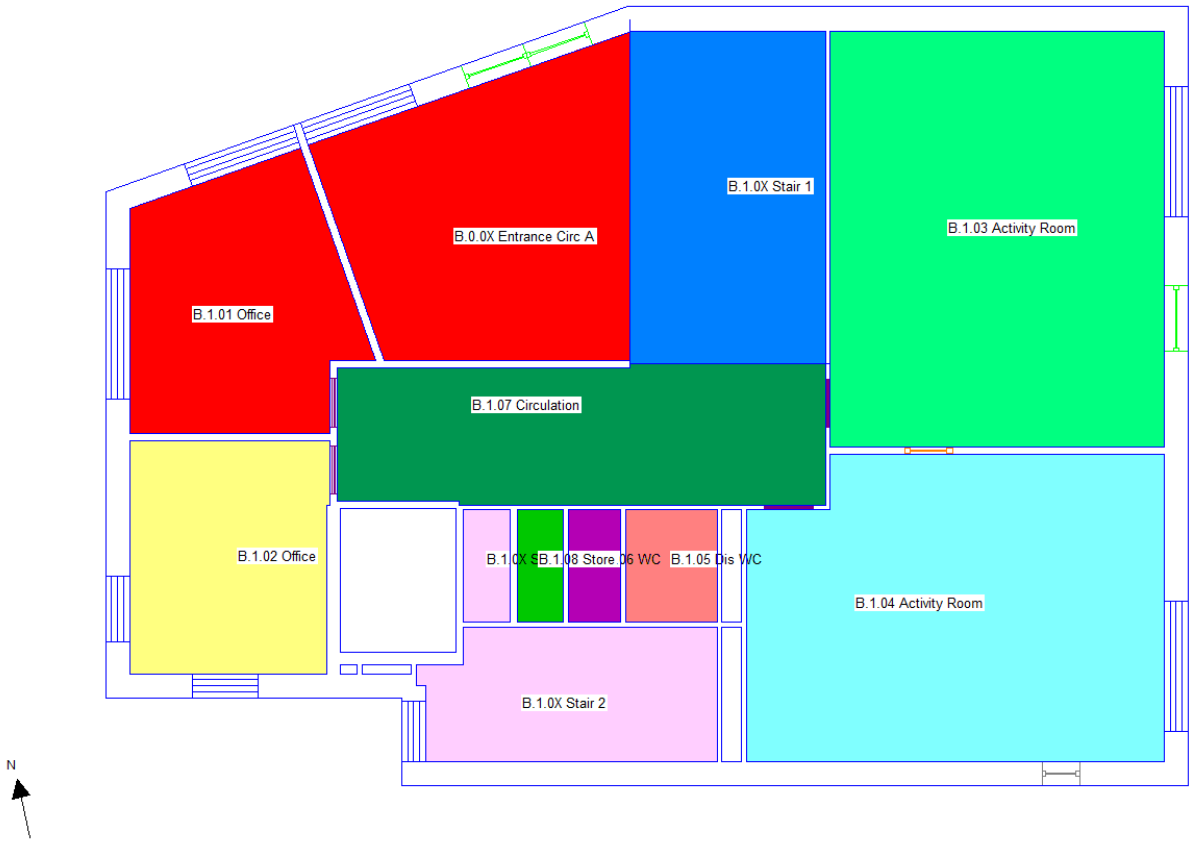
APPENDIX 1

Plans From the TAS model

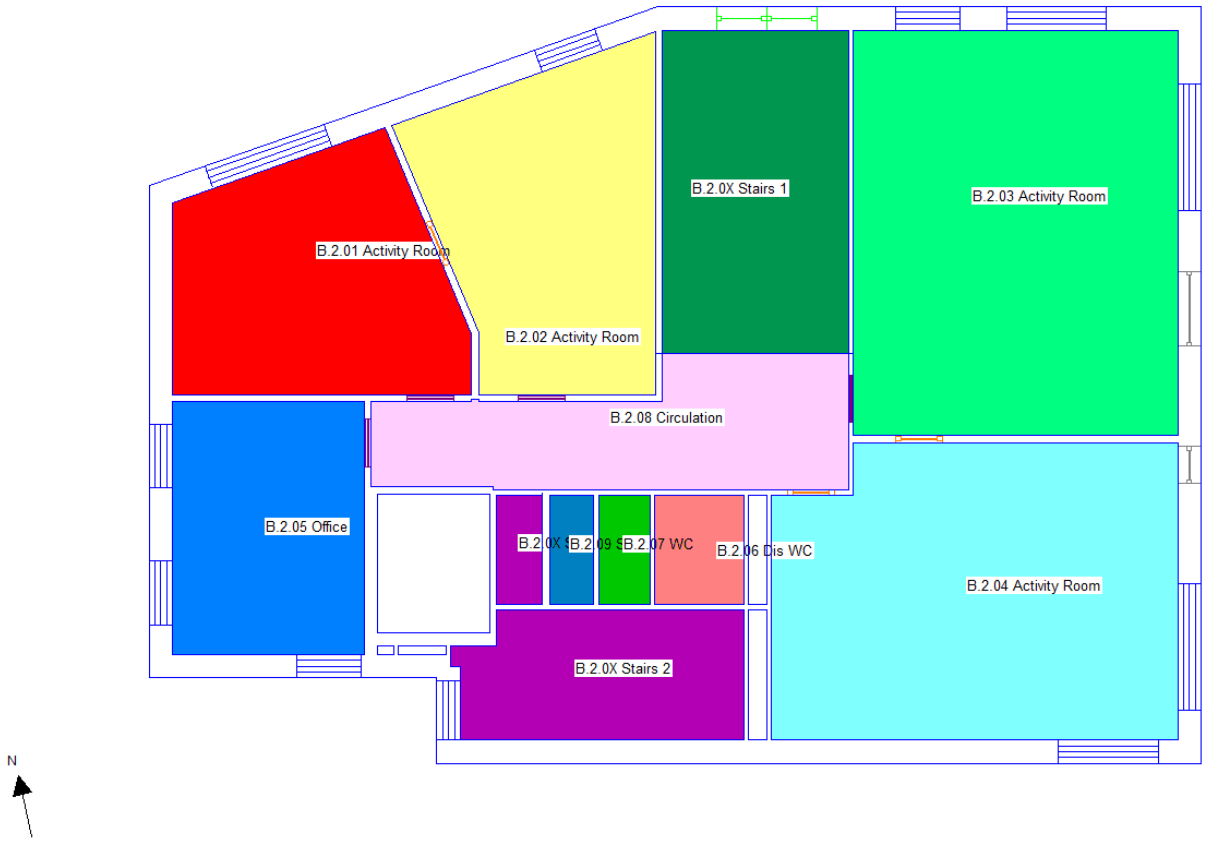
Ground Floor



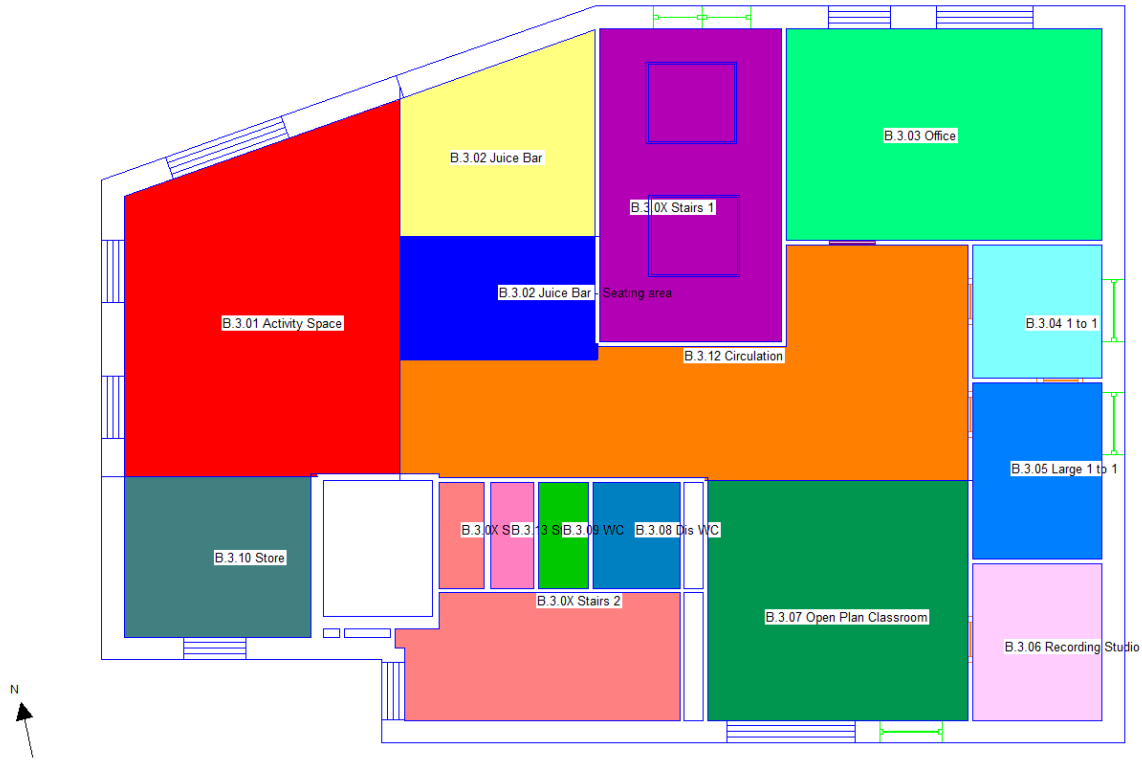
First Floor


B.1.0X Stair 1
B.1.03 Activity Room
B.0.0X Entrance Circ A
B.1.01 Office
B.1.07 Circulation
B.1.02 Office
B.1.0X SB.1.08 Store
06 WC
B.1.05 Dis WC
B.1.04 Activity Room
B.1.0X Stair 2
N

Second Floor



Third Floor


B.3.02 Juice Bar
B.3.03 Office
B.3.0X Stairs 1
B.3.02 Juice Bar - Seating area
B.3.01 Activity Space
B.3.04 1 to 1
B.3.12 Circulation
B.3.05 Large 1 to 1
B.3.10 Store
B.3.0X SB.3.13 S
B.3.09 WC
B.3.08 Dis WC
B.3.0X Stairs 2
B.3.07 Open Plan Classroom
B.3.06 Recording Studio
N

APPENDIX 2

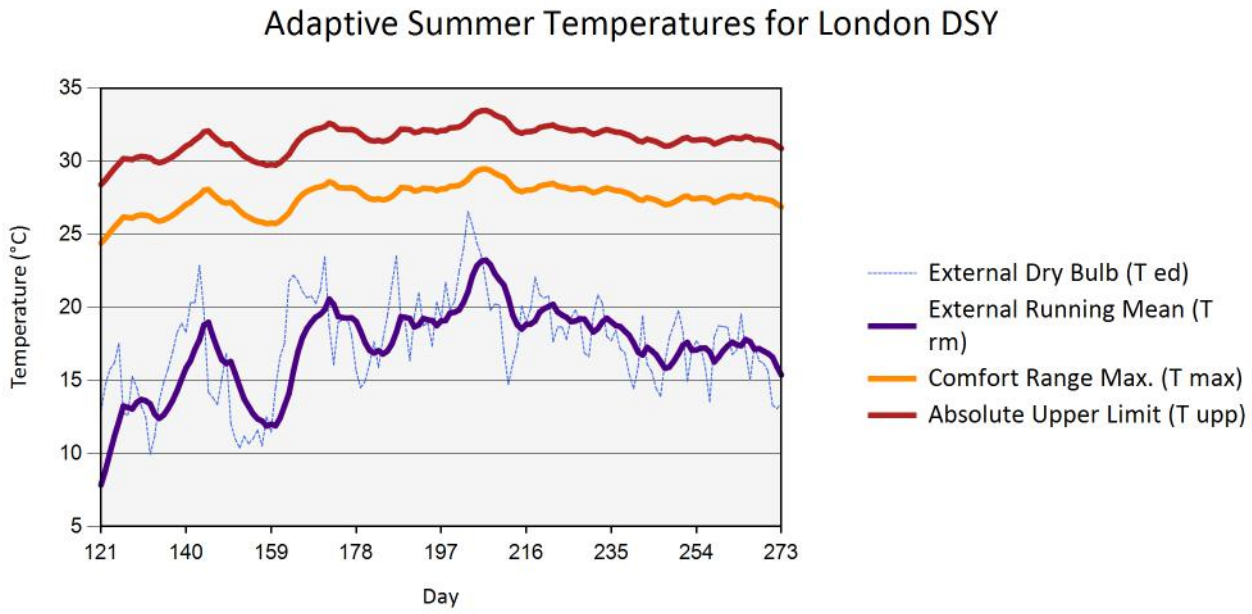
INTERNAL CONDITIONS

Zone name	Floor area (m2)	Volume (m3)	Infiltration (ACH)	Lighting Gain (W/m2)	Number of Occupants	Occupancy Sensible Gain per person (W)	Occupancy Sensible W	Occupancy Latent Gain per person (W)	Occupancy Latent W/m2	Equipment Sensible (W)	Occupancy Schedule	
B.0.01 Office	8.62	26.08	0.1	8	1	57	57	43	43	130	8am-6pm	
B.0.02 Cafe Seating	32.94	99.65	0.1	8	10	57	570	43	430	220	8am-6pm	Assume average of 20 with 30 peak between 12 to 1300hrs
B.0.03 Seating	71.84	217.31	0.1	8	4	57	228	43	172	220	8am-6pm	
B.0.21 Activity room 1	12.46	37.68	0.1	8	3	57	171	43	129	120	8am-6pm	Assume 1 laptop/person (36W)
B.0.22 Activity room 2	13.23	40.03	0.1	8	3	57	171	43	129	108	8am-6pm	Assume 1 laptop/person (36W)
B.0.23 Activity room 3	10.51	31.79	0.1	8	3	57	171	43	129	108	8am-6pm	Assume 1 laptop/person (36W)
B.0.0X Stairs 1	28.47	97.51	0.1	8	-						8am-6pm	
B.0.0X Stairs 2	18.34	111.23	0.1	8	-						8am-6pm	
B.0.0X Second entrance	12.17	36.81	0.1	8	-						8am-6pm	
B.0.0X Entrance Circ A	70.02	214.21	0.1	8	-						8am-6pm	
B.1.01 Office	23.37	72.32	0.1	8	3	57	171	43		90	8am-6pm	
B.1.02 Office	20.02	61.96	0.1	8	4	57	228	43	172	120	8am-6pm	
B.1.03 Activity Room	60.16	186.20	0.1	8	13	57	741	43	559	200	8am-6pm	
B.1.04 Activity Room	53.57	165.80	0.1	8	13	57	741	43	559	200	8am-6pm	
										29	6pm-8am	the client has confirmed the kiln will be used throughout the night for 3 days a week
B.1.0X Stair 1	28.12	99.14	0.1	8	-						8am-6pm	
B.1.0X Stair 2	18.80	65.27	0.1	8	-						8am-6pm	
B.1.07 Circulation	28.89	89.41	0.1	8	-						8am-6pm	
B.2.01 Activity Room	28.88	89.37	0.1	8	3	57	171	43	129	120	8am-6pm	
B.2.02 Activity Room	31.60	97.79	0.1	8	6	57	342	43	258	200	8am-6pm	
B.2.03 Activity Room	60.30	186.63	0.1	8	30	57	1710	43	1290	200	8am-6pm	
B.2.04 Activity Room	53.44	165.38	0.1	8	28	57	1596	43	1204	200	8am-6pm	
B.2.05 Office	22.24	68.84	0.1	8	4	57	228	43	172	200	8am-6pm	
B.2.08 Circulation	23.34	72.24	0.1	8	-						8am-6pm	
B.2.0X Stairs 1	27.60	97.30	0.1	8	-						8am-6pm	
B.2.0X Stairs 2	18.80	65.27	0.1	8	-						8am-6pm	
B.3.01 Activity Space	43.73	136.66	0.1	8	7	57	399	43	301	120	8am-6pm	
B.3.02 Juice Bar	16.20	50.62	0.1	8	4	57	228	43	172	200	8am-6pm	
B.3.03 Office	32.37	101.17	0.1	8	4	57	228	43	172	120	8am-6pm	
B.3.04 1 to 1	8.34	26.05	0.1	8	2	57	114	43	86	60	8am-6pm	
B.3.05 Large 1 to 1	11.01	34.41	0.1	8	2	57	114	43	86	120	8am-6pm	
B.3.07 Open Plan Classroom	30.34	94.81	0.1	8	10	57	570	43	430	200	8am-6pm	
B.3.0X Stairs 1	27.58	87.01	0.1	8	-						8am-6pm	
B.3.0X Stairs 2	18.78	59.19	0.1	8	-						8am-6pm	
B.3.12 Circulation	43.93	137.28	0.1	8	-						8am-6pm	
B.3.02 Juice Bar - Seating area	11.66	36.45	0.1	8	10	57	570	43	430	120	8am-6pm	

APPENDIX 3

TM52 ANALYSIS RESULTS

Adaptive Overheating Report (CIBSE TM52)



The adaptive overheating assessment tests rooms against three criteria. If a room fails any two of the three criteria then it is said to overheat.
1. The first criterion sets a limit for the number of hours that the operative temperature exceeds the comfort temperature by 1°C or more during the occupied hours over the summer period (1st May to 30th September).
2. The second criterion deals with the severity of the overheating within any one day. This sets a daily limit for acceptability.
3. The third criterion sets an absolute maximum daily temperature for the room.

Project Details

Building Designer File (.tbd): highgate newtown cc L2_kiln 29W.tbd
Simulation Results File (.tsd): highgate newtown cc L2_kiln 29W v2.tsd
Date: 05 February 2020
Building Category: Category II
Report Criteria: TM52

Results

Zone Name	Occupied Summer Hours	Max. Exceedable Hours	Criterion 1: #Hours Exceeding Comfort Range	Criterion 2: Peak Daily Weighted Exceedance	Criterion 3: #Hours Exceeding Absolute Limit	Result
B.0.01 Office	1280	38	0	0.0	0	Pass
B.0.02 Cafe Seating	1530	45	6	4.0	0	Pass
B.0.21 Activity room 1	1530	45	35	20.0	0	Pass
B.0.22 Activity room 2	1530	45	37	20.0	0	Pass
B.0.23 Activity room 3	1530	45	23	15.0	0	Pass
B.1.01 Office	1280	38	13	6.0	0	Pass
B.1.02 Office	1280	38	13	6.0	0	Pass
B.1.03 Activity Room	1530	45	5	3.0	0	Pass
B.1.04 Activity Room	1530	45	11	5.0	0	Pass
B.2.01 Activity Room	1530	45	8	4.0	0	Pass

Adaptive Overheating Report (CIBSE TM52)

Results

Zone Name	Occupied Summer Hours	Max. Exceedable Hours	Criterion 1: #Hours Exceeding Comfort Range	Criterion 2: Peak Daily Weighted Exceedance	Criterion 3: #Hours Exceeding Absolute Limit	Result
B.2.02 Activity Room	1530	45	23	8.0	0	Pass
B.2.03 Activity Room	1530	45	22	19.0	0	Pass
B.2.04 Activity Room	1530	45	27	19.0	0	Pass
B.2.05 Office	1280	38	17	7.0	0	Pass
B.3.01 Activity Space	1530	45	15	10.0	0	Pass
B.3.02 Juice Bar	1530	45	19	13.0	0	Pass
B.3.03 Office	1280	38	4	4.0	0	Pass
B.3.04 1 to 1	1530	45	21	7.0	0	Pass
B.3.05 Large 1 to 1	1530	45	17	6.0	0	Pass
B.3.07 Open Plan Classroom	1530	45	20	11.0	0	Pass
B.3.02 Juice Bar - Seating area	1530	45	21	13.0	0	Pass

Document

A Study of Residential Overheating Risk (TM59)

Project

Highgate Newtown Residential and Community Centre Redevelopment

Client

London Borough of Camden

Date

January 2019

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REVISION HISTORY

Suitability	Revision	Version Date	Summary of Changes	Changes marked
D5	P3	29-01-2019	Original issue	

DISTRIBUTION

This document has been distributed to:

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APPROVALS

This document requires the following approvals.

Name	Title
Rolfe Jackson	Director

CONTENTS

1.0 TM59 METHODOLOGY

TM59 aims to provide a standardised approach to predicting overheating risk for residential building designs using dynamic thermal analysis. The aim is to produce a test that encourages good design that is comfortable within sensible limits, without being so stringent that it over-promotes the use of mechanical cooling.

The assessment should follow the following steps:

1. A suitable sample of units within a development should be selected
2. All sample units should be zoned into the separate rooms including kitchens, living rooms, bedrooms, bathrooms and halls
3. Building constructions should be modelled as proposed, accurately reflecting thermal properties such as thermal mass, insulation and solar transmittance for glazing
4. Standard profiles should be applied for occupancy, lighting and equipment gains
5. Guidance on the treatment of communal corridors from section 3.8 of the TM59 guide should be followed
6. Pipework and equipment, e.g. heat interface unit gains from community heating systems, should follow the guidance given in section 3.9 of the TM59 guide
7. Openable windows should be included in the model and follow the guidance given in section 3.3 of the TM59 guide
8. Any internal or external shading provision should be included in the model and follow the guidance included in section 3.7 of the TM59 guide
9. Additional mechanical ventilation including mechanical ventilation with heat recovery (MVHR) or extract systems should be included in the model and follow the guidance given in section 3.5 of the TM59 guide
10. Air speed assumptions should be based on the guidance given in section 3.6 of the TM59 guide
11. The weather file used for the methodology should be the DSY1 (Design Summer Year) file most appropriate for the site location for the 2020s, high emissions, 50% percentile scenario; see section 3.2 of the TM59 guide

12. The assessment should be undertaken using hourly dynamic simulation modelling, which includes all the relevant features of the building. For homes which are predominantly naturally ventilated: compliance is based on passing *both* of the following two criteria, the first of which is taken from CIBSE TM52 Criterion 1:

a) *For living rooms, kitchens and bedrooms*: the number of hours during which ΔT is greater than or equal to one degree (K) during the period May to September inclusive shall not be more than 3% of occupied hours. (CIBSE TM52 Criterion 1: *Hours of exceedance*).

b) *For bedrooms only*: to guarantee comfort during the sleeping hours the operative temperature in the bedroom from 10pm to 7am shall not exceed 26 °C for more than 1% of annual hours. (*Note*: 1% of the annual hours between 22:00 and 07:00 for bedrooms is 32 hours, so 33 or more hours above 26 °C will be recorded as a fail).

Criteria 2 and 3 of CIBSE TM52 may fail to be met, but both a) and b) above *must* be passed for all relevant rooms.

For homes predominantly mechanically ventilated: the CIBSE fixed temperature test must be followed, i.e. all occupied rooms should not exceed an operative temperature of 26 ˚C for more than 3% of the annual occupied annual hours (CIBSE Guide A (2015a)).

The following three criteria, taken together, provide a robust yet balanced assessment of the risk of overheating of buildings in the UK and Europe. A room or building that fails any two of the three criteria is classed as overheating.

TM52 Criterion definitions:
Criterion 1: Hours of exceedance (H e)
Sets a limit for the number of hours that the operative temperature can exceed the threshold comfort temperature (upper limit of the range of comfort temperature) by 1 K or more during the occupied hours of a typical non-heating season (1 May to 30 September).

Criterion 2: Daily weighted exceedance (W e)
Deals with the severity of overheating within any one day, which can be as important as its frequency, the level of which is a function of both temperature rise and its duration. This criterion sets a daily limit for acceptability.

Criterion 3: Upper limit temperature (T upp)
Sets an absolute maximum daily temperature for a room, beyond which the level of overheating is unacceptable

It is recommended that TM52 and TM59 guides are read in conjunction with this report for calculation methodology and further clarification. A dynamic thermal model of the building has been created using Tas software, which has been used to assess the dynamic response of the building. The simulation uses hourly time steps and covers the whole year, with the period of assessment from 1st May to 30th September.

2.0 INPUT DATA AND ASSUMPTIONS

2.1 Overview

This report assesses the two flat blocks (blocks A&D) and the house block (block C).

Assessments have been carried out using the London 2020s, high emissions, 50th percentile DSY1 scenario as outlined in the TM59. We have also included results for the London 2020s, high emissions, 50th percentile DSY2 & DSY3 weather files.
The London 2050s, high emissions, 50th percentile DSY1 future weather file has not yet been run.

The majority of bedrooms are double bedrooms and this is denoted in the zone reference as “dbed”, the single bedrooms are labelled as “sbed”.

The zone labels have been set as follows: ‘room usage.number of bedrooms [Block(Flat number) floor]’. For example the space liv/kit.2 [A6 2F] is a living and kitchen space in a 2 bedroom flat on the 2F of block A, this is also the 6th flat in the zoning system.

For the location of zones please see floor plans the appendices.

2.2 Constructions

Construction Information & U values have been provided by the client and are as follows:

External Wall Block A, U Value = 0.15 W/m²K

Layer	M-Code	Width (mm)	Conductivity (W/m.K)	Density (kg/m³)	Specific Heat (J/kg.K)	Description
Inner	am1plast\1	26.0	0.079	400	837	LIGHTWEIGHT PLASTER 1 *4
2	am1ins\2	100.0	0.035	25	1000	GLASS FIBRE 2 *3
3	Cement particleboard	13.0	0.230	1200	1500	Cement particle board
4	am1ins\2	100.0	0.035	25	1000	GLASS FIBRE 2 *3
5	am1cav\5	50.0	0.000	0	0	50MM AIR (HORIZONTAL FLOW - OP
6	am1brick\1	102.0	0.700	1700	800	BRICKWORK *4

External Wall Block C, U Value = 0.15 W/m²K

Layer	M-Code	Width (mm)	Conductivity (W/m.K)	Density (kg/m³)	Specific Heat (J/kg.K)	Description
Inner	am1plast\1	26.0	0.079	400	837	LIGHTWEIGHT PLASTER 1 *4
2	am1cav\5	50.0	0.000	0	0	50MM AIR (HORIZONTAL FLOW - OP
3	am1ins\2	115.0	0.022	25	1000	GLASS FIBRE 2 *3
4	am1brick\1	300.0	0.700	1700	800	BRICKWORK *4

External Wall Block D, U Value = 0.15 W/m²K

Layer	M-Code	Width (mm)	Conductivity (W/m.K)	Density (kg/m³)	Specific Heat (J/kg.K)	Description
Inner	am1plast\1	26.0	0.079	400	837	LIGHTWEIGHT PLASTER 1 *4
2	am1block\1	140.0	0.317	1040	1050	FOAMED SLAG CONC. PARTITION BL
3	am1ins\2	115.0	0.022	25	1000	GLASS FIBRE 2 *3
4	am1cav\5	50.0	0.000	0	0	50MM AIR (HORIZONTAL FLOW - OP
5	am1brick\1	102.0	0.700	1700	800	BRICKWORK *4

Ground Floor Block A = 0.11 W/m²K

Layer	M-Code	Width (mm)	Conductivity (W/m.K)	Density (kg/m³)	Specific Heat (J/kg.K)	Description
Inner	am1fin\3	3.0	0.060	186	1360	CARPET *2
2	Screed	50.0	1.150	1800	1000	
3	Insulation 5	175.0	0.021	20	1030	
4	Reinforced concrete	250.0	2.300	2300	1000	
5	Notional/Reference Soil*	1000.0	1.500	1250	2500	

**Notional/Reference Soil Not included in U value Calc.*

Ground Floor Block C = 0.13 W/m²K

Layer	M-Code	Width (mm)	Conductivity (W/m.K)	Density (kg/m³)	Specific Heat (J/kg.K)	Description
Inner	am1fin\3	3.0	0.060	186	1360	CARPET *2
2	Screed	50.0	1.150	1800	1000	
3	Insulation 5	155.0	0.021	20	1030	
4	Reinforced concrete	200.0	2.300	2300	1000	
5	Notional/Reference Soil*	1000.0	1.500	1250	2500	

**Notional/Reference Soil Not included in U value Calc.*

Ground Floor Block D = 0.11 W/m²K

Layer	M-Code	Width (mm)	Conductivity (W/m.K)	Density (kg/m³)	Specific Heat (J/kg.K)	Description
Inner	am1fin\3	3.0	0.060	186	1360	CARPET *2
2	Screed	50.0	1.150	1800	1000	
3	Insulation 5	180.0	0.023	20	1030	
4	am1block\1	140.0	0.317	1040	1050	FOAMED SLAG CONC. PARTITION BL

5	Notional/Reference Soil*	1000.0	1.500	1250	2500	

**Notional/Reference Soil Not included in U value Calc.*

Flat Concrete Roof, U Value = 0.11 W/m²K

Layer	M-Code	Width (mm)	Conductivity (W/m.K)	Density (kg/m³)	Specific Heat (J/kg.K)	Description
Inner	Plasterboard	12.5	0.210	700	1000	
2	am1cav\15	100.0	0.000	0	0	100MM AIR (UPWARD FLOW - OPAQU
3	Concrete Deck	250.0	2.000	2400	1000	
4	Insulation 1	168.0	0.021	40	1450	
5	membrane	10.0	1.000	1100	1000	
6	am1soil\1	200.0	0.700	1280	1840	CLAY 1 (DARK) *2

Pitched House Roof, U Value = 0.11 W/m²K

Layer	M-Code	Width (mm)	Conductivity (W/m.K)	Density (kg/m³)	Specific Heat (J/kg.K)	Description
Inner	Plasterboard	12.5	0.210	700	1000	
2	am1cav\16	200.0	0.000	0	0	200MM AIR (UPWARD FLOW - OPAQU
3	am1ins\1	175.0	0.021	12	833	GLASS FIBRE 1 *3
4	am1asph\9	3.0	0.410	960	1000	ROOFING FELT 1 *2
5	am1tile\10	5.0	2.000	2700	753	SLATE, GREY *4

Internal Floor Blocks A & C, U Value = 0.53 W/m²K

Layer	M-Code	Width (mm)	Conductivity (W/m.K)	Density (kg/m³)	Specific Heat (J/kg.K)	Description
Inner	Plasterboard	12.5	0.210	700	1000	
2	am1cav\15	100.0	0.000	0	0	100MM AIR (UPWARD FLOW - OPAQU
3	Reinforced concrete	250.0	2.300	2300	1000	
4	Insulation 1	25.0	0.021	40	1450	
5	Screed	50.0	1.150	1800	1000	
6	am1fin\3	4.0	0.060	186	1360	CARPET *2

Internal Floor Block D, U Value = 0.11 W/m²K

Layer	M-Code	Width (mm)	Conductivity (W/m.K)	Density (kg/m³)	Specific Heat (J/kg.K)	Description
Inner	Plasterboard	12.5	0.210	700	1000	
2	am1cav\15	100.0	0.000	0	0	100MM AIR (UPWARD FLOW - OPAQU
3	Reinforced concrete	250.0	2.300	2300	1000	
4	Insulation 1	170.0	0.021	40	1450	
5	Screed	50.0	1.150	1800	1000	
6	am1fin\3	4.0	0.060	186	1360	CARPET *2

Stud Internal Wall (for internal walls within dwellings) Blocks A & D, U Value = 0.77 W/m²K

Layer	M-Code	Width (mm)	Conductivity (W/m.K)	Density (kg/m³)	Specific Heat (J/kg.K)	Description
Inner	Plasterboard	25.0	0.210	700	1000	
2	Air, 50mm wall	50.0	0.010	0	0	Horizontal flow
3	am1ins\1	25.0	0.040	12	833	GLASS FIBRE 1 *3
4	Plasterboard	25.0	0.210	700	1000	

Stud Internal Wall (for internal walls within dwellings) Block C, U Value = 0.31 W/m²K

Layer	M-Code	Width (mm)	Conductivity (W/m.K)	Density (kg/m³)	Specific Heat (J/kg.K)	Description
Inner	Plasterboard	25.0	0.210	700	1000	
2	Air, 50mm wall	50.0	0.010	0	0	Horizontal flow
3	am1ins\1	100.0	0.040	12	833	GLASS FIBRE 1 *3
4	Plasterboard	25.0	0.210	700	1000	

Block Internal Wall (for internal walls between 2 dwellings or between dwellings and communal corridors), U Value = 0.29 W/m²K

Layer	M-Code	Width (mm)	Conductivity (W/m.K)	Density (kg/m³)	Specific Heat (J/kg.K)	Description
Inner	am1plast\1	26.0	0.079	400	837	LIGHTWEIGHT PLASTER 1 *4
2	am1block\1	100.0	0.317	1040	1050	FOAMED SLAG CONC. PARTITION BL
3	am1ins\1	75.0	0.040	12	833	GLASS FIBRE 1 *3
4	am1block\1	100.0	0.317	1040	1050	FOAMED SLAG CONC. PARTITION BL
5	am1plast\1	26.0	0.079	400	837	LIGHTWEIGHT PLASTER 1 *4

Opaque Doors U Values = 2.18 W/m²K

Layer	M-Code	Width (mm)	Conductivity (W/m.K)	Density (kg/m³)	Specific Heat (J/kg.K)	Description
Inner	Hardwood	52.0	0.180	2100	1000	

Glazing:

All Glazing:

Glazing, U = 1.4 Wm2K								
Light		Solar Energy (EN410)				Pilkington Shading Coefficients		
Transmittance	Reflectance	Direct Transmittance	Direct Reflectance	Direct Absorptance	Total Transmittance (G-Value)	Short Wavelength	Long Wavelength	Total
0.42	0.06	0.27	0.09	0.64	0.37	0.31	0.11	0.43

No blinds have been modelled at this stage.

All frames have a U value of 2.20 W/m²K

2.3 Internal Gains

Occupancy and equipment gains have been modelled as outlined in table 1 found at the end of this section of the report below, this table has been taken directly from TM59. Corridors and WCs have been modelled with no occupancy or equipment gains.

In line with TM59, lighting is modelled as on from 6pm to 11pm every day at a value of 2.0 W/m² in bedrooms and living rooms/kitchens, WCs and corridors.

Infiltration has been modelled as 0.15ach for all spaces.

No heating has been modelled through the summer period.

Each flat has a heat interface unit in the dwelling corridor, this has been modelled as 39W equipment gains in each flat corridor space, the studio flat has this gain modelled in the living space as it does not have a corridor.

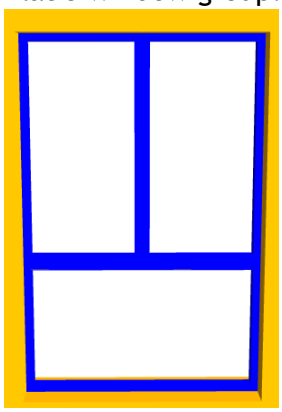
2.4 Natural Ventilation

A number of windows have been modelled as openable, they have been modelled with a maximum openable areas depending on the window type (more information on this has been given below) and begin to open when the adjacent space reaches 21°C and are fully open when this spaces reaches 22°C. Windows have been modelled as open when the adjacent space is occupied, this means bedroom windows are always openable and living room/bathroom windows are openable from 9am-10pm. The exception to this is GF bedrooms which have windows modelled as openable from 9am-10pm for security reasons.

Internal doors have been modelled as fully open during waking hours (this has been taken to be 8am-11pm).

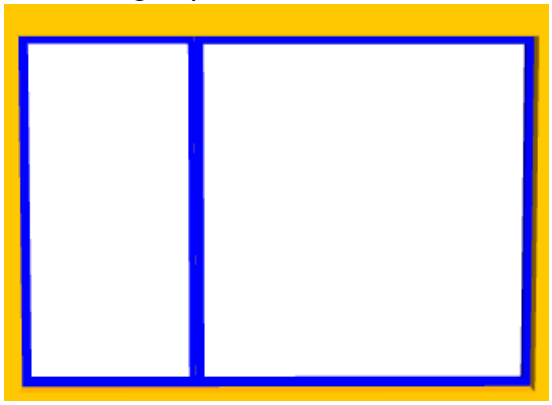
The following windows groups have been modelled as openable in the TM59 assessment:

Flat 3 window group:



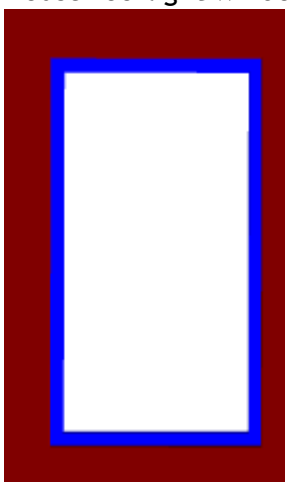
The top 2 windows have been modelled with a maximum openable proportion of 100%, the bottom window has not been modelled as openable.

Flat door group:



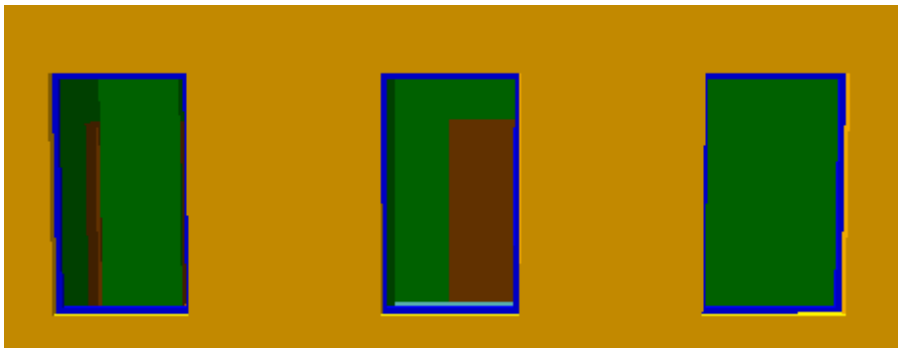
The smaller door has been modelled as fully openable, the larger pane has been not been modelled as openable.

House rooflight window:



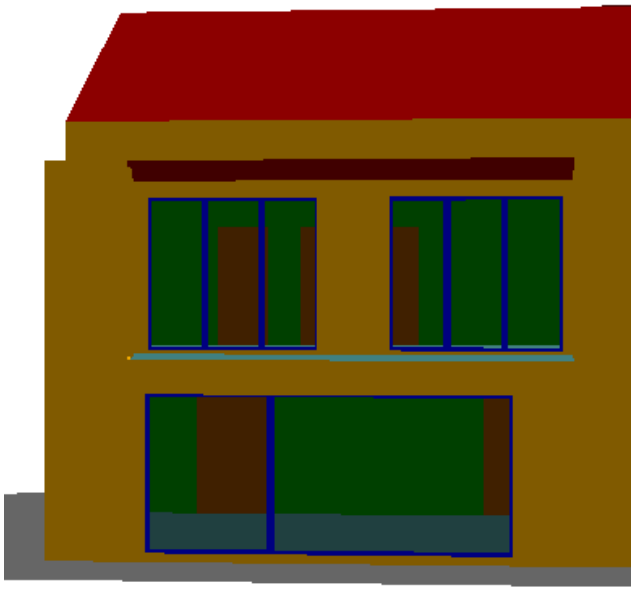
The 1F rooflight windows in the house have been modelled with a maximum openable proportion of 100%.

The 1F House bedroom/corridor windows:



These have been modelled with a maximum openable proportion of 100%.

House Doors:



For the GF the smaller pane has been modelled as fully openable, for the 1F one pane has been modelled as fully openable.

2.5 Mechanical Ventilation

Living and kitchen and bedroom spaces have 6l/s of air mechanically extracted overnight. Makeup air is assumed to be at outside air conditions. This has been modelled 24/7.

No further mechanical ventilation has been included

2.6 Comfort Cooling

No comfort cooling has been modelled.

2.7 Blinds

No blinds have been included in the assessment.

2.8 Shading

Only the adjacent buildings have been included as shade buildings.

Table 1 - Dwelling occupancy and equipment gain

Unit/ room type	Occupancy	Equipment load
Studio	2 people at 70% gains from 11 pm to 8 am 2 people at 100% gains from 8 am to 11 pm	Peak load of 450 W from 6 pm to 8 pm*. 200 W from 8 pm to 10 pm 110 W from 9 am to 6 pm and 10 pm to 12 pm Base load of 85 W for the rest of the day
1-bedroom apartment: living room/kitchen	1 person from 9 am to 10 pm; room is unoccupied for the rest of the day	Peak load of 450 W from 6 pm to 8 pm 200 W from 8 pm to 10 pm 110 W from 9 am to 6 pm and from 10 pm to 12 pm Base load of 85 W for the rest of the day
1-bedroom apartment: living room	1 person at 75% gains from 9 am to 10 pm; room is unoccupied for the rest of the day	Peak load of 150 W from 6 pm to 10 pm 60 W from 9 am to 6 pm and from 10 pm to 12 pm Base load of 35 W for the rest of the day
1-bedroom apartment: kitchen	1 person at 25% gains from 9 am to 10 pm; room is unoccupied for the rest of the day	Peak load of 300 W from 6 pm to 8 pm Base load of 50 W for the rest of the day
2-bedroom apartment: living room/kitchen	2 people from 9 am to 10 pm; room is unoccupied for the rest of the day	Peak load of 450 W from 6 pm to 8 pm 200 W from 8 pm to 10 pm 110 W from 9 am to 6 pm and from 10 pm to 12 pm Base load of 85 W for the rest of the day
2-bedroom apartment: living room	2 people at 75% gains from 9 am to 10 pm; room is unoccupied for the rest of the day	Peak load of 150 W from 6 pm to 10 pm 60 W from 9 am to 6 pm and from 10 pm to 12 pm Base load of 35 W for the rest of the day
2-bedroom apartment: kitchen	2 people at 25% gains from 9 am to 10 pm; room is unoccupied for the rest of the day	Peak load of 300 W from 6 pm to 8 pm Base load of 50 W for the rest of the day
3-bedroom apartment: living room/kitchen	3 people from 9 am to 10 pm; room is unoccupied for the rest of the day	Peak load of 450 W from 6 pm to 8 pm 200W from 8 pm to 10 pm 110 W from 9 am to 6 pm and from 10 pm to 12 pm Base load of 85 W for the rest of the day
3-bedroom apartment: living room	3 people at 75% gains from 9 am to 10 pm; room is unoccupied for the rest of the day	Peak load of 150 W from 6 pm to 10 pm 60 W from 9 am to 6 pm and from 10 pm to 12 pm Base load of 35 W for the rest of the day
3-bedroom apartment: kitchen	3 people at 25% gains from 9 am to 10 pm; room is unoccupied for the rest of the day	Peak load of 300 W from 6 pm to 8 pm base load of 50 W for the rest of the day
Double bedroom	2 people at 70% gains from 11 pm to 8 am 2 people at full gains from 8 am to 9 am and from 10 pm to 11 pm 1 person at full gains in the bedroom from 9 am to 10 pm	Peak load of 80 W from 8 am to 11 pm Base load of 10 W during the sleeping hours
Single bedroom (too small to accommodate double bed)	1 person at 70% gains from 11 pm to 8 am 1 person at full gains from 8 am to 11 pm	Peak load of 80 W from 8 am to 11 pm Base load of 10 W during sleeping hours
Communal corridors	Assumed to be zero	Pipework heat loss only; see section 3.1 above

* All times in GMT

3.0 RESULTS

The thermal comfort category used is category II, in accordance with the CIBSE TM59 guidance.

Results for the weather files used can be as outlined found below

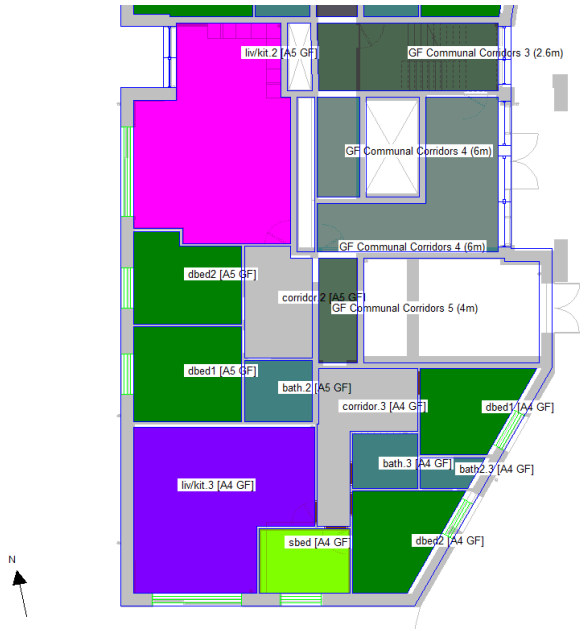
Result	Weather file (London Heathrow)
4.1	DSY1 2020 high emission 50percentile
4.2	DSY2 2020 high emission 50percentile
4.3	DSY3 2020 high emission 50percentile

A few flats show a risk of overheating during the summer period, mainly in the living room/kitchen space. Those will be further analysed in the next design stage in order to reduce that risk.

4.0 APPENDICES

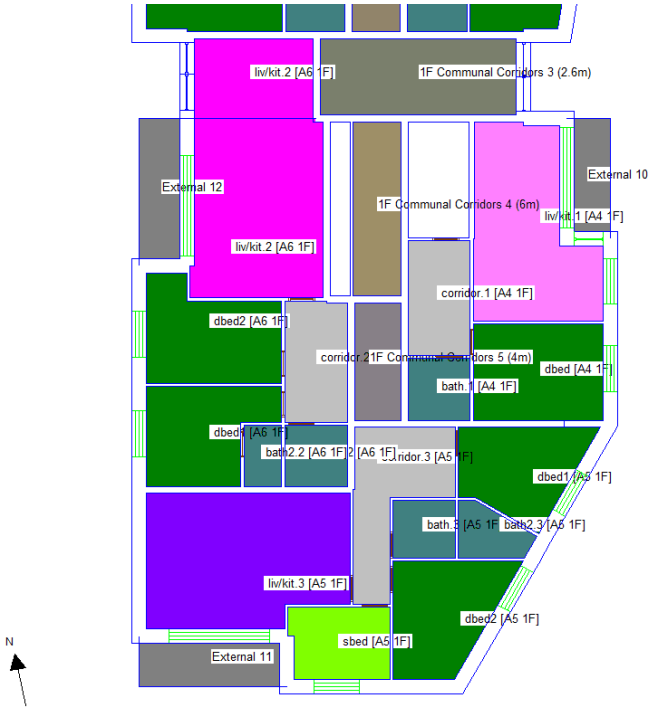
4.1 Floor plans from the Tas model

Block A GF South

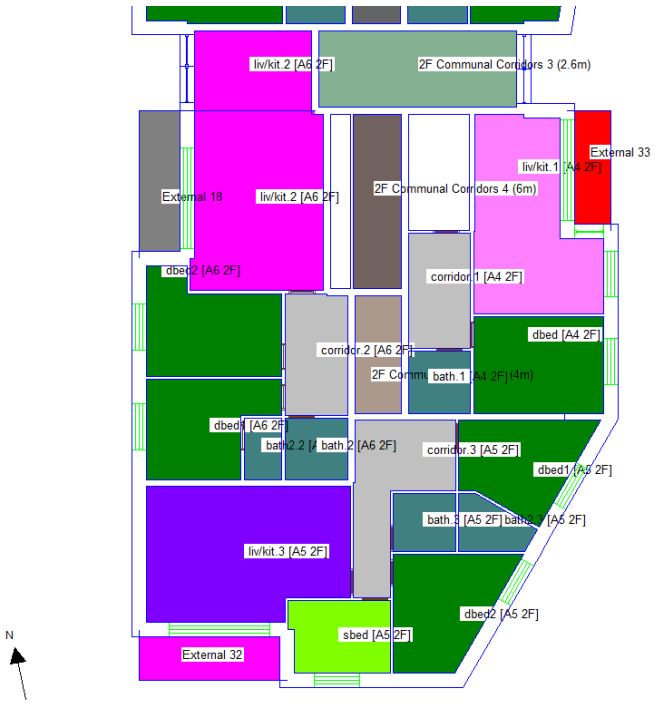


**Please note that only the coloured and labelled spaces were included in this assessment.*

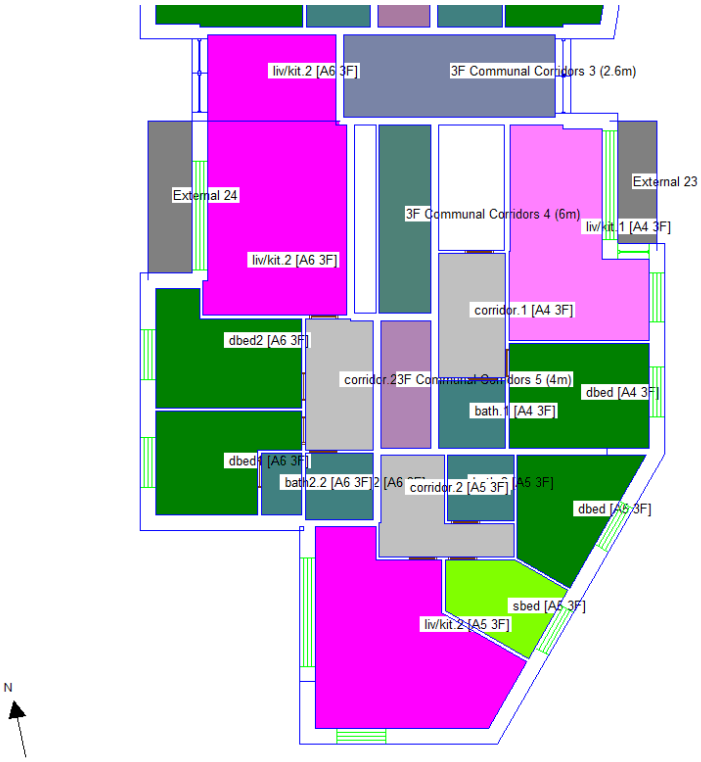
Block A 1F South



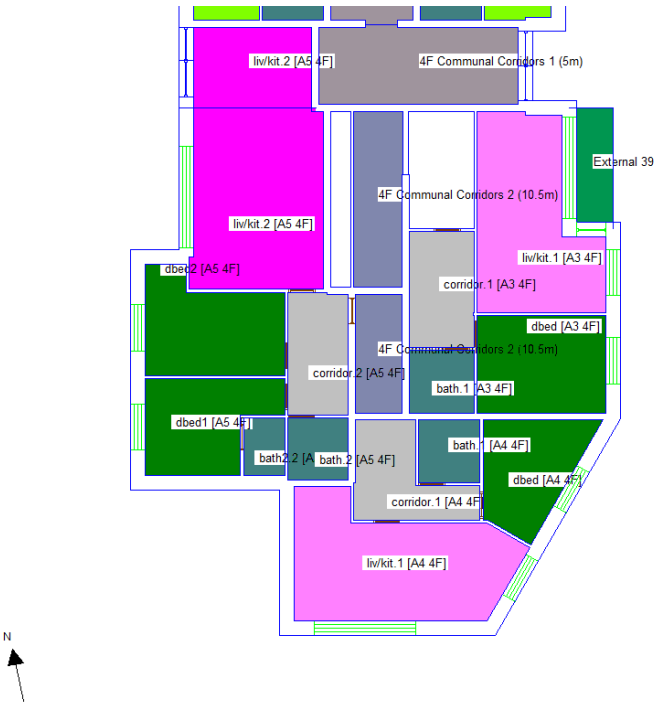
Block A 2F South



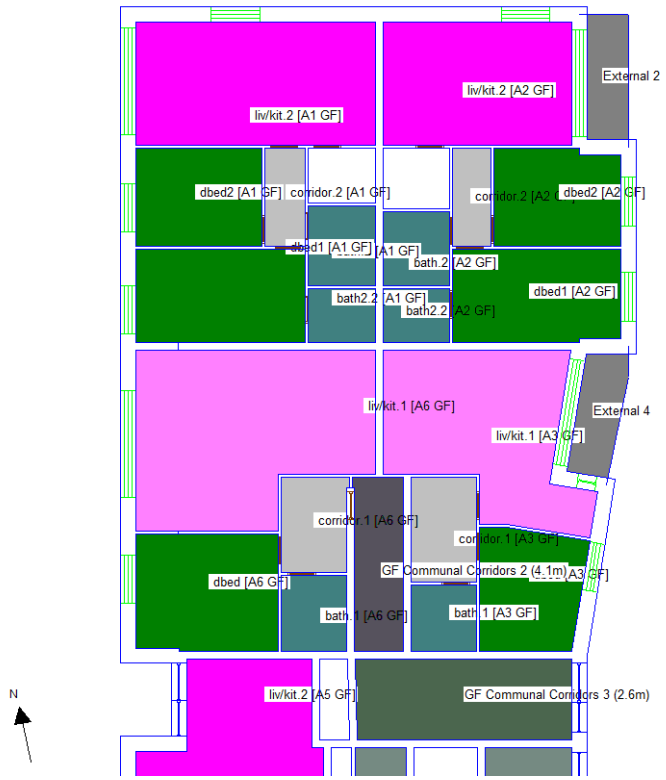
Block A 3F South



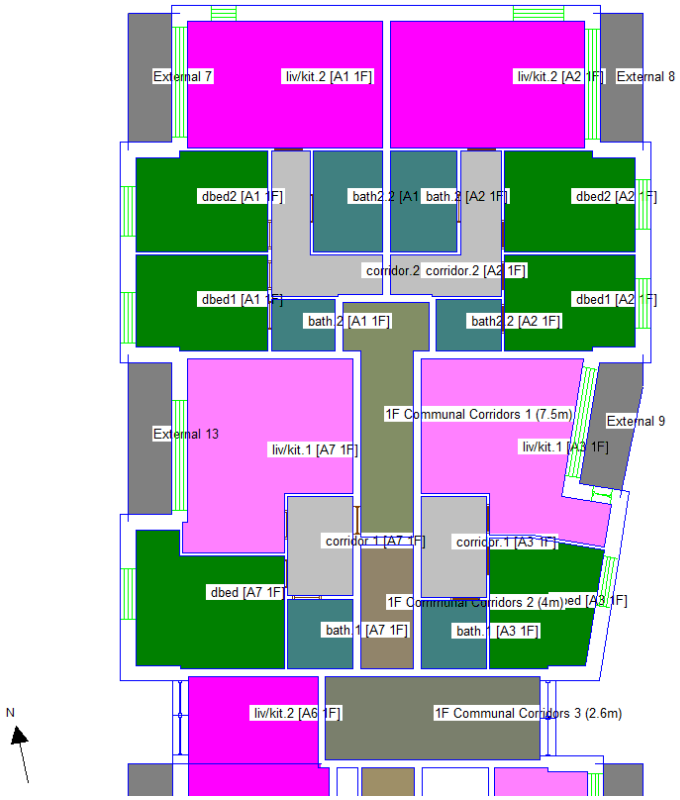
Block A 4F South



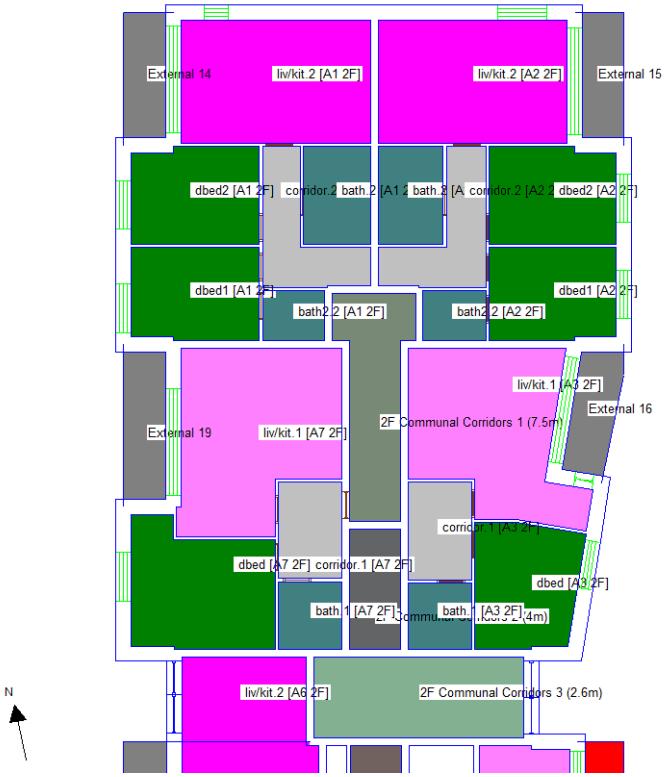
Block A GF North



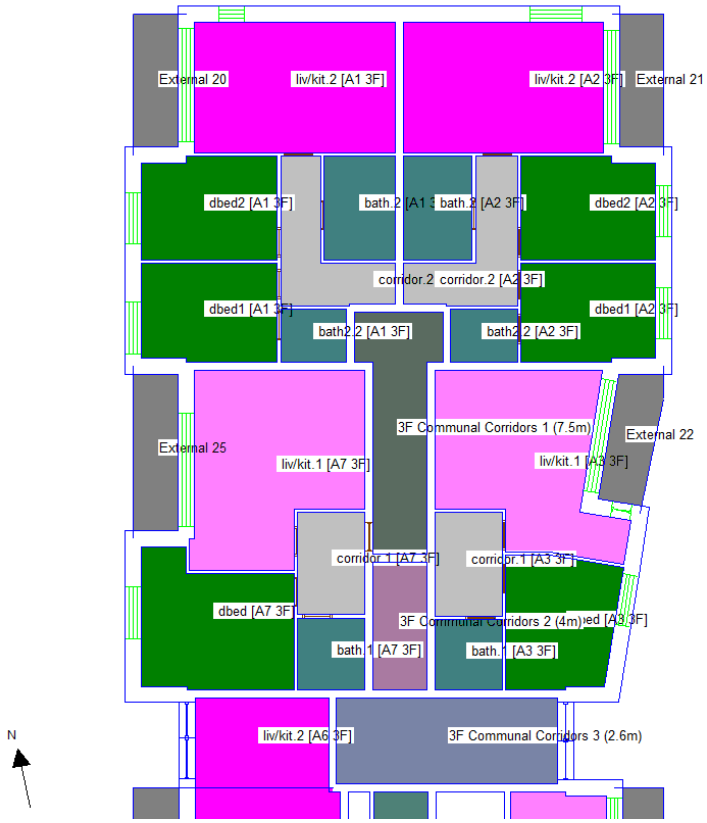
Block A 1F North



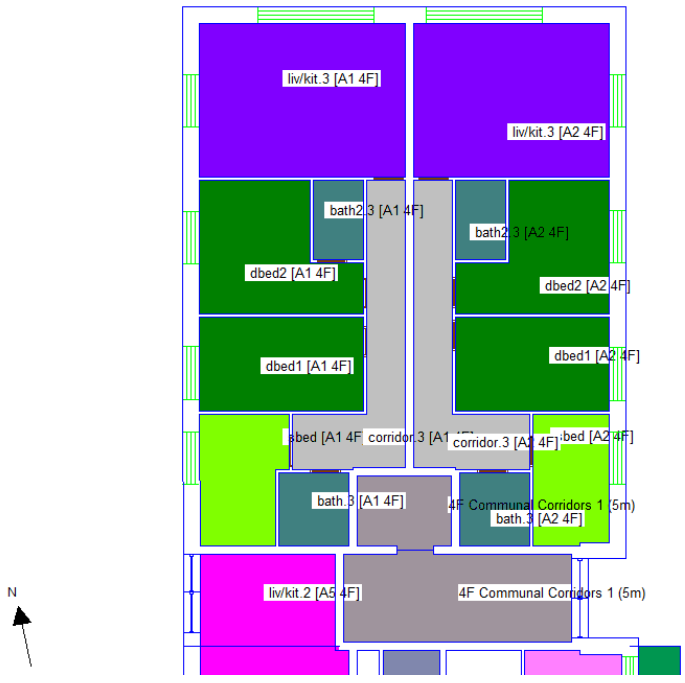
Block A 2F North



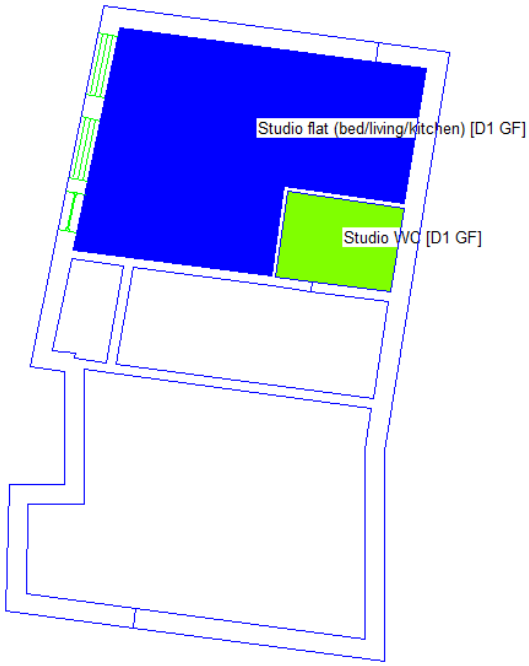
Block A 3F North



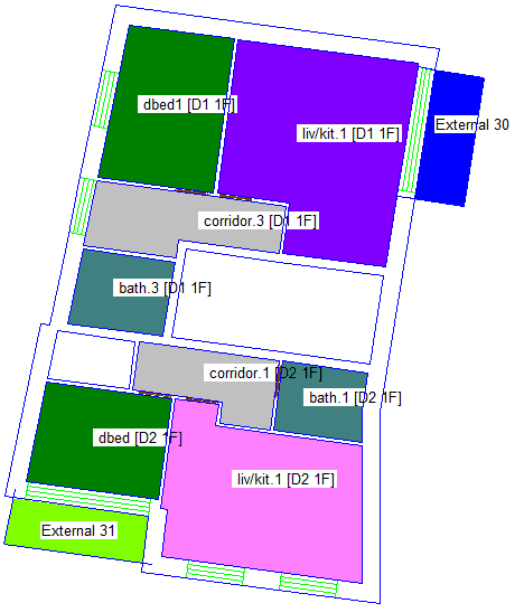
Block A 4F North



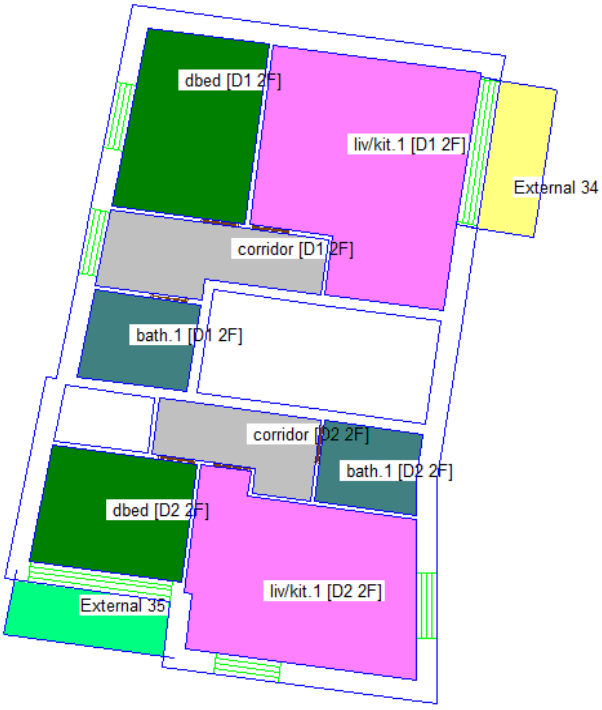
Block D GF



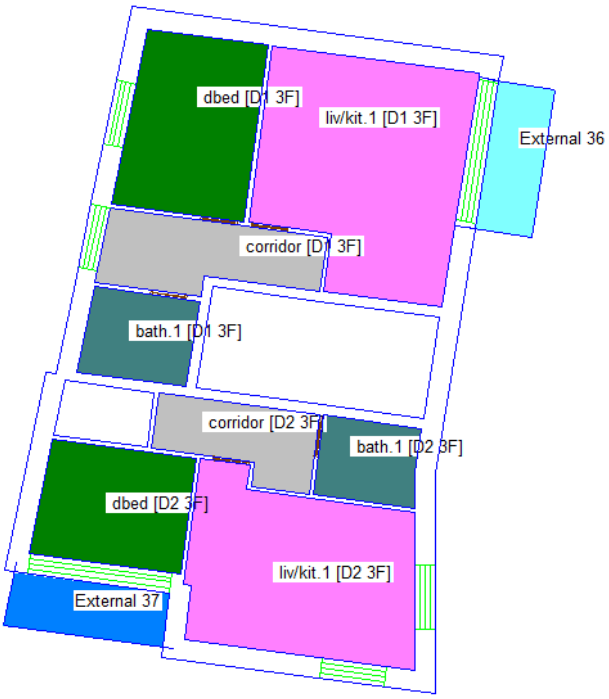
Block D 1F



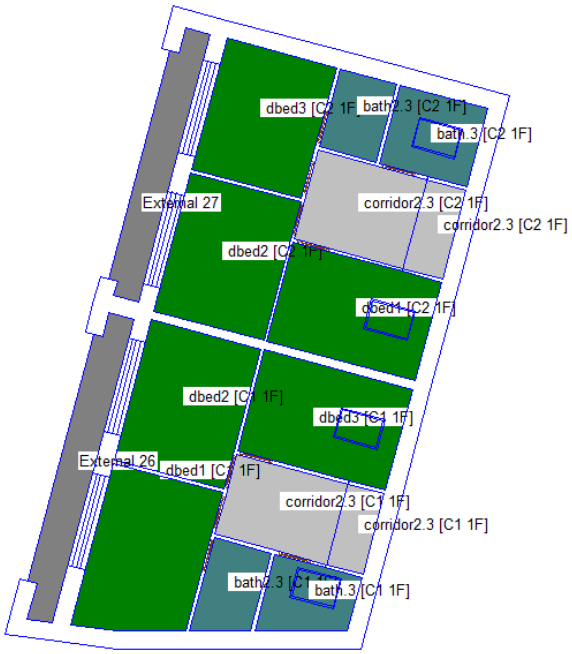
Block D 2F



Block D 3F



Block C (House) GF



4.2 “TM59 DSY1 24hr vent 100% FA windows”

Domestic Overheating (CIBSE TM59)

Project Details

Building Designer File (.tbd): HN_Resi new_London_LHR_DSY1.tbd
Simulation Results File (.tsd): HN_Resi new_London_LHR_DSY1.tsd
Date: 29 January 2019
Building Category: Category II

Natural Ventilation Overheating Results

Zone Name	Room Use	Occupied Summer Hours	Max. Exceedable Hours	Criterion 1: #Hours Exceeding Comfort Range	Annual Night Occupied Hours for Bedroom	Max Exceedable Night Hours	Criterion 2: Number of Night Hours Exceeding 26 °C for Bedrooms.	Result
1F Communal Corridors 1 (7.5m)	Other	0	0	0	N/A	N/A	N/A	Pass
1F Communal Corridors 2 (4m)	Other	0	0	0	N/A	N/A	N/A	Pass
1F Communal Corridors 3 (2.6m)	Other	0	0	0	N/A	N/A	N/A	Pass
1F Communal Corridors 4 (6m)	Other	0	0	0	N/A	N/A	N/A	Pass
1F Communal Corridors 5 (4m)	Other	0	0	0	N/A	N/A	N/A	Pass
2F Communal Corridors 1 (7.5m)	Other	0	0	0	N/A	N/A	N/A	Pass
2F Communal Corridors 2 (4m)	Other	0	0	0	N/A	N/A	N/A	Pass
2F Communal Corridors 3 (2.6m)	Other	0	0	0	N/A	N/A	N/A	Pass
2F Communal Corridors 4 (6m)	Other	0	0	0	N/A	N/A	N/A	Pass
2F Communal Corridors 5 (4m)	Other	0	0	0	N/A	N/A	N/A	Pass
3F Communal Corridors 1 (7.5m)	Other	0	0	0	N/A	N/A	N/A	Pass
3F Communal Corridors 2 (4m)	Other	0	0	0	N/A	N/A	N/A	Pass
3F Communal Corridors 3 (2.6m)	Other	0	0	0	N/A	N/A	N/A	Pass
3F Communal Corridors 4 (6m)	Other	0	0	0	N/A	N/A	N/A	Pass
3F Communal Corridors 5 (4m)	Other	0	0	0	N/A	N/A	N/A	Pass
4F Communal Corridors 1 (5m)	Other	0	0	0	N/A	N/A	N/A	Pass

Domestic Overheating (CIBSE TM59)

4F Communal Corridors 2 (10.5m)	Other	0	0	0	N/A	N/A	N/A	Pass
bath2.2 [A1 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath2.2 [A1 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath2.2 [A1 3F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath2.2 [A1 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
bath2.2 [A2 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath2.2 [A2 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath2.2 [A2 3F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath2.2 [A2 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
bath2.2 [A5 4F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath2.2 [A6 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath2.2 [A6 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath2.2 [A6 3F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath2.3 [A1 4F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath2.3 [A2 4F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath2.3 [A4 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
bath2.3 [A5 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath2.3 [A5 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath2.3 [C1 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath2.3 [C2 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath3.3 [C1 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
bath3.3 [C2 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.1 [A3 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.1 [A3 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.1 [A3 3F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.1 [A3 4F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.1 [A3 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.1 [A4 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.1 [A4 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.1 [A4 3F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.1 [A4 4F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.1 [A6 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.1 [A7 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.1 [A7 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.1 [A7 3F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.1 [D1 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.1 [D1 3F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.1 [D2 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.1 [D2 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.1 [D2 3F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.2 [A1 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.2 [A1 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.2 [A1 3F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.2 [A1 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.2 [A2 1F]	Other	0	0	0	N/A	N/A	N/A	Pass

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bath.2 [A2 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.2 [A2 3F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.2 [A2 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.2 [A5 3F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.2 [A5 4F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.2 [A5 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.2 [A6 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.2 [A6 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.2 [A6 3F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.3 [A1 4F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.3 [A2 4F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.3 [A4 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.3 [A5 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.3 [A5 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.3 [C1 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.3 [C2 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.3 [D1 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor2.3 [C1 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor2.3 [C2 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor [D1 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor [D1 3F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor [D2 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor [D2 3F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.1 [A3 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.1 [A3 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.1 [A3 3F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.1 [A3 4F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.1 [A3 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.1 [A4 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.1 [A4 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.1 [A4 3F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.1 [A4 4F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.1 [A6 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.1 [A7 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.1 [A7 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.1 [A7 3F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.1 [D2 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.2 [A1 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.2 [A1 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.2 [A1 3F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.2 [A1 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.2 [A2 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.2 [A2 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.2 [A2 3F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.2 [A2 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.2 [A5 3F]	Other	0	0	0	N/A	N/A	N/A	Pass

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corridor.2 [A5 4F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.2 [A5 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.2 [A6 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.2 [A6 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.2 [A6 3F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.3 [A1 4F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.3 [A2 4F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.3 [A4 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.3 [A5 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.3 [A5 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.3 [C1 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.3 [C2 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.3 [D1 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
dbed1 [A1 1F]	Bedroom	3672	110	28	3285	32	7	Pass
dbed1 [A1 2F]	Bedroom	3672	110	29	3285	32	7	Pass
dbed1 [A1 3F]	Bedroom	3672	110	29	3285	32	7	Pass
dbed1 [A1 4F]	Bedroom	3672	110	33	3285	32	8	Pass
dbed1 [A1 GF]	Bedroom	3672	110	1	3285	32	5	Pass
dbed1 [A2 1F]	Bedroom	3672	110	17	3285	32	7	Pass
dbed1 [A2 2F]	Bedroom	3672	110	19	3285	32	7	Pass
dbed1 [A2 3F]	Bedroom	3672	110	24	3285	32	8	Pass
dbed1 [A2 4F]	Bedroom	3672	110	26	3285	32	7	Pass
dbed1 [A2 GF]	Bedroom	3672	110	4	3285	32	82	Fail
dbed1 [A4 GF]	Bedroom	3672	110	37	3285	32	85	Fail
dbed1 [A5 1F]	Bedroom	3672	110	22	3285	32	7	Pass
dbed1 [A5 2F]	Bedroom	3672	110	26	3285	32	7	Pass
dbed1 [A5 4F]	Bedroom	3672	110	43	3285	32	12	Pass
dbed1 [A5 GF]	Bedroom	3672	110	62	3285	32	161	Fail
dbed1 [A6 1F]	Bedroom	3672	110	35	3285	32	9	Pass
dbed1 [A6 2F]	Bedroom	3672	110	34	3285	32	9	Pass
dbed1 [A6 3F]	Bedroom	3672	110	42	3285	32	10	Pass
dbed1 [C1 1F]	Bedroom	3672	110	42	3285	32	7	Pass
dbed1 [C2 1F]	Bedroom	3672	110	43	3285	32	12	Pass
dbed1 [D1 1F]	Bedroom	3672	110	20	3285	32	6	Pass
dbed2 [A1 1F]	Bedroom	3672	110	33	3285	32	7	Pass
dbed2 [A1 2F]	Bedroom	3672	110	36	3285	32	8	Pass
dbed2 [A1 3F]	Bedroom	3672	110	36	3285	32	8	Pass
dbed2 [A1 4F]	Bedroom	3672	110	25	3285	32	8	Pass
dbed2 [A1 GF]	Bedroom	3672	110	17	3285	32	5	Pass
dbed2 [A2 1F]	Bedroom	3672	110	22	3285	32	7	Pass
dbed2 [A2 2F]	Bedroom	3672	110	25	3285	32	8	Pass
dbed2 [A2 3F]	Bedroom	3672	110	28	3285	32	8	Pass
dbed2 [A2 4F]	Bedroom	3672	110	23	3285	32	8	Pass
dbed2 [A2 GF]	Bedroom	3672	110	22	3285	32	91	Fail
dbed2 [A4 GF]	Bedroom	3672	110	37	3285	32	82	Fail
dbed2 [A5 1F]	Bedroom	3672	110	26	3285	32	7	Pass

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dbed2 [A5 2F]	Bedroom	3672	110	29	3285	32	7	Pass
dbed2 [A5 4F]	Bedroom	3672	110	49	3285	32	12	Pass
dbed2 [A5 GF]	Bedroom	3672	110	88	3285	32	202	Fail
dbed2 [A6 1F]	Bedroom	3672	110	48	3285	32	10	Pass
dbed2 [A6 2F]	Bedroom	3672	110	47	3285	32	9	Pass
dbed2 [A6 3F]	Bedroom	3672	110	49	3285	32	10	Pass
dbed2 [C1 1F]	Bedroom	3672	110	59	3285	32	7	Pass
dbed2 [C2 1F]	Bedroom	3672	110	62	3285	32	7	Pass
dbed3 [C1 1F]	Bedroom	3672	110	39	3285	32	11	Pass
dbed3 [C2 1F]	Bedroom	3672	110	72	3285	32	7	Pass
dbed [A3 1F]	Bedroom	3672	110	37	3285	32	10	Pass
dbed [A3 2F]	Bedroom	3672	110	38	3285	32	11	Pass
dbed [A3 3F]	Bedroom	3672	110	40	3285	32	10	Pass
dbed [A3 4F]	Bedroom	3672	110	0	3285	32	6	Pass
dbed [A3 GF]	Bedroom	3672	110	85	3285	32	218	Fail
dbed [A4 1F]	Bedroom	3672	110	0	3285	32	8	Pass
dbed [A4 2F]	Bedroom	3672	110	6	3285	32	9	Pass
dbed [A4 3F]	Bedroom	3672	110	6	3285	32	9	Pass
dbed [A4 4F]	Bedroom	3672	110	29	3285	32	6	Pass
dbed [A5 3F]	Bedroom	3672	110	37	3285	32	7	Pass
dbed [A6 GF]	Bedroom	3672	110	1	3285	32	6	Pass
dbed [A7 1F]	Bedroom	3672	110	29	3285	32	10	Pass
dbed [A7 2F]	Bedroom	3672	110	33	3285	32	11	Pass
dbed [A7 3F]	Bedroom	3672	110	30	3285	32	11	Pass
dbed [D1 2F]	Bedroom	3672	110	24	3285	32	6	Pass
dbed [D1 3F]	Bedroom	3672	110	26	3285	32	6	Pass
dbed [D2 1F]	Bedroom	3672	110	73	3285	32	6	Pass
dbed [D2 2F]	Bedroom	3672	110	76	3285	32	7	Pass
dbed [D2 3F]	Bedroom	3672	110	131	3285	32	8	Fail
kit.3 [C1 GF]	Living Room / Kitchen	1989	59	14	N/A	N/A	N/A	Pass
kit.3 [C2 GF]	Living Room / Kitchen	1989	59	26	N/A	N/A	N/A	Pass
liv.3 [C1 GF]	Living Room / Kitchen	1989	59	28	N/A	N/A	N/A	Pass
liv.3 [C2 GF]	Living Room / Kitchen	1989	59	65	N/A	N/A	N/A	Fail
liv/kit.1 [A3 1F]	Living Room / Kitchen	1989	59	43	N/A	N/A	N/A	Pass
liv/kit.1 [A3 2F]	Living Room / Kitchen	1989	59	58	N/A	N/A	N/A	Pass
liv/kit.1 [A3 3F]	Living Room / Kitchen	1989	59	60	N/A	N/A	N/A	Fail
liv/kit.1 [A3 4F]	Living Room / Kitchen	1989	59	112	N/A	N/A	N/A	Fail
liv/kit.1 [A3 GF]	Living Room / Kitchen	1989	59	32	N/A	N/A	N/A	Pass
liv/kit.1 [A4 1F]	Living Room / Kitchen	1989	59	143	N/A	N/A	N/A	Fail
liv/kit.1 [A4 2F]	Living Room / Kitchen	1989	59	119	N/A	N/A	N/A	Fail
liv/kit.1 [A4 3F]	Living Room / Kitchen	1989	59	117	N/A	N/A	N/A	Fail
liv/kit.1 [A4 4F]	Living Room / Kitchen	1989	59	77	N/A	N/A	N/A	Fail
liv/kit.1 [A6 GF]	Living Room / Kitchen	1989	59	57	N/A	N/A	N/A	Pass
liv/kit.1 [A7 1F]	Living Room / Kitchen	1989	59	116	N/A	N/A	N/A	Fail
liv/kit.1 [A7 2F]	Living Room / Kitchen	1989	59	136	N/A	N/A	N/A	Fail
liv/kit.1 [A7 3F]	Living Room / Kitchen	1989	59	123	N/A	N/A	N/A	Fail

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liv/kit.1 [D1 1F]	Living Room / Kitchen	1989	59	37	N/A	N/A	N/A	Pass
liv/kit.1 [D1 2F]	Living Room / Kitchen	1989	59	32	N/A	N/A	N/A	Pass
liv/kit.1 [D1 3F]	Living Room / Kitchen	1989	59	32	N/A	N/A	N/A	Pass
liv/kit.1 [D2 1F]	Living Room / Kitchen	1989	59	63	N/A	N/A	N/A	Fail
liv/kit.1 [D2 2F]	Living Room / Kitchen	1989	59	41	N/A	N/A	N/A	Pass
liv/kit.1 [D2 3F]	Living Room / Kitchen	1989	59	47	N/A	N/A	N/A	Pass
liv/kit.2 [A1 1F]	Living Room / Kitchen	1989	59	52	N/A	N/A	N/A	Pass
liv/kit.2 [A1 2F]	Living Room / Kitchen	1989	59	56	N/A	N/A	N/A	Pass
liv/kit.2 [A1 3F]	Living Room / Kitchen	1989	59	52	N/A	N/A	N/A	Pass
liv/kit.2 [A1 GF]	Living Room / Kitchen	1989	59	43	N/A	N/A	N/A	Pass
liv/kit.2 [A2 1F]	Living Room / Kitchen	1989	59	36	N/A	N/A	N/A	Pass
liv/kit.2 [A2 2F]	Living Room / Kitchen	1989	59	52	N/A	N/A	N/A	Pass
liv/kit.2 [A2 3F]	Living Room / Kitchen	1989	59	51	N/A	N/A	N/A	Pass
liv/kit.2 [A2 GF]	Living Room / Kitchen	1989	59	23	N/A	N/A	N/A	Pass
liv/kit.2 [A5 3F]	Living Room / Kitchen	1989	59	60	N/A	N/A	N/A	Fail
liv/kit.2 [A5 4F]	Living Room / Kitchen	1989	59	165	N/A	N/A	N/A	Fail
liv/kit.2 [A5 GF]	Living Room / Kitchen	1989	59	124	N/A	N/A	N/A	Fail
liv/kit.2 [A6 1F]	Living Room / Kitchen	1989	59	142	N/A	N/A	N/A	Fail
liv/kit.2 [A6 2F]	Living Room / Kitchen	1989	59	143	N/A	N/A	N/A	Fail
liv/kit.2 [A6 3F]	Living Room / Kitchen	1989	59	141	N/A	N/A	N/A	Fail
liv/kit.3 [A1 4F]	Living Room / Kitchen	1989	59	56	N/A	N/A	N/A	Pass
liv/kit.3 [A2 4F]	Living Room / Kitchen	1989	59	54	N/A	N/A	N/A	Pass
liv/kit.3 [A4 GF]	Living Room / Kitchen	1989	59	67	N/A	N/A	N/A	Fail
liv/kit.3 [A5 1F]	Living Room / Kitchen	1989	59	31	N/A	N/A	N/A	Pass
liv/kit.3 [A5 2F]	Living Room / Kitchen	1989	59	31	N/A	N/A	N/A	Pass
sbed [A1 4F]	Bedroom	3672	110	45	3285	32	7	Pass
sbed [A2 4F]	Bedroom	3672	110	37	3285	32	6	Pass
sbed [A4 GF]	Bedroom	3672	110	65	3285	32	70	Fail
sbed [A5 1F]	Bedroom	3672	110	52	3285	32	5	Pass
sbed [A5 2F]	Bedroom	3672	110	55	3285	32	7	Pass
sbed [A5 3F]	Bedroom	3672	110	53	3285	32	7	Pass
Utility2 [C1 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
Utility2 [C2 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
Utility [C1 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
Utility [C2 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
GF Communal Corridors 2 (4.1m)	Other	0	0	0	N/A	N/A	N/A	Pass
GF Communal Corridors 3 (2.6m)	Other	0	0	0	N/A	N/A	N/A	Pass
GF Communal Corridors 4 (6m)	Other	0	0	0	N/A	N/A	N/A	Pass
GF Communal Corridors 5 (4m)	Other	0	0	0	N/A	N/A	N/A	Pass
Studio flat (bed/living/kitchen) [D1 GF]	Bedroom	3672	110	15	3285	32	104	Fail

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Studio WC [D1 GF]	Other	0	0	0	N/A	N/A	N/A	Pass

*Zone name's that have an orange coloured font are bedrooms which do not have 24/7 365 days a year occupancy, as per the

4.3 “TM59 DSY2 24hr vent 100% FA windows”

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Project Details

Building Designer File (.tbd): HN_Resi new_London_LHR_DSY2.tbd
Simulation Results File (.tsd): HN_Resi new_London_LHR_DSY2.tsd
Date: 29 January 2019
Building Category: Category II

Natural Ventilation Overheating Results

Zone Name	Room Use	Occupied Summer Hours	Max. Exceedable Hours	Criterion 1: #Hours Exceeding Comfort Range	Annual Night Occupied Hours for Bedroom	Max Exceedable Night Hours	Criterion 2: Number of Night Hours Exceeding 26 °C for Bedrooms.	Result
1F Communal Corridors 1 (7.5m)	Other	0	0	0	N/A	N/A	N/A	Pass
1F Communal Corridors 2 (4m)	Other	0	0	0	N/A	N/A	N/A	Pass
1F Communal Corridors 3 (2.6m)	Other	0	0	0	N/A	N/A	N/A	Pass
1F Communal Corridors 4 (6m)	Other	0	0	0	N/A	N/A	N/A	Pass
1F Communal Corridors 5 (4m)	Other	0	0	0	N/A	N/A	N/A	Pass
2F Communal Corridors 1 (7.5m)	Other	0	0	0	N/A	N/A	N/A	Pass
2F Communal Corridors 2 (4m)	Other	0	0	0	N/A	N/A	N/A	Pass
2F Communal Corridors 3 (2.6m)	Other	0	0	0	N/A	N/A	N/A	Pass
2F Communal Corridors 4 (6m)	Other	0	0	0	N/A	N/A	N/A	Pass
2F Communal Corridors 5 (4m)	Other	0	0	0	N/A	N/A	N/A	Pass
3F Communal Corridors 1 (7.5m)	Other	0	0	0	N/A	N/A	N/A	Pass
3F Communal Corridors 2 (4m)	Other	0	0	0	N/A	N/A	N/A	Pass
3F Communal Corridors 3 (2.6m)	Other	0	0	0	N/A	N/A	N/A	Pass
3F Communal Corridors 4 (6m)	Other	0	0	0	N/A	N/A	N/A	Pass
3F Communal Corridors 5 (4m)	Other	0	0	0	N/A	N/A	N/A	Pass
4F Communal Corridors 1 (5m)	Other	0	0	0	N/A	N/A	N/A	Pass

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4F Communal Corridors 2 (10.5m)	Other	0	0	0	N/A	N/A	N/A	Pass
bath2.2 [A1 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath2.2 [A1 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath2.2 [A1 3F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath2.2 [A1 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
bath2.2 [A2 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath2.2 [A2 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath2.2 [A2 3F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath2.2 [A2 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
bath2.2 [A5 4F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath2.2 [A6 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath2.2 [A6 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath2.2 [A6 3F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath2.3 [A1 4F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath2.3 [A2 4F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath2.3 [A4 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
bath2.3 [A5 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath2.3 [A5 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath2.3 [C1 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath2.3 [C2 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath3.3 [C1 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
bath3.3 [C2 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.1 [A3 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.1 [A3 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.1 [A3 3F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.1 [A3 4F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.1 [A3 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.1 [A4 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.1 [A4 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.1 [A4 3F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.1 [A4 4F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.1 [A6 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.1 [A7 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.1 [A7 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.1 [A7 3F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.1 [D1 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.1 [D1 3F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.1 [D2 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.1 [D2 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.1 [D2 3F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.2 [A1 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.2 [A1 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.2 [A1 3F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.2 [A1 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.2 [A2 1F]	Other	0	0	0	N/A	N/A	N/A	Pass

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bath.2 [A2 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.2 [A2 3F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.2 [A2 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.2 [A5 3F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.2 [A5 4F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.2 [A5 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.2 [A6 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.2 [A6 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.2 [A6 3F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.3 [A1 4F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.3 [A2 4F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.3 [A4 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.3 [A5 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.3 [A5 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.3 [C1 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.3 [C2 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.3 [D1 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor2.3 [C1 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor2.3 [C2 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor [D1 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor [D1 3F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor [D2 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor [D2 3F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.1 [A3 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.1 [A3 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.1 [A3 3F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.1 [A3 4F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.1 [A3 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.1 [A4 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.1 [A4 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.1 [A4 3F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.1 [A4 4F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.1 [A6 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.1 [A7 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.1 [A7 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.1 [A7 3F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.1 [D2 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.2 [A1 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.2 [A1 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.2 [A1 3F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.2 [A1 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.2 [A2 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.2 [A2 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.2 [A2 3F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.2 [A2 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.2 [A5 3F]	Other	0	0	0	N/A	N/A	N/A	Pass

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corridor.2 [A5 4F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.2 [A5 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.2 [A6 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.2 [A6 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.2 [A6 3F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.3 [A1 4F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.3 [A2 4F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.3 [A4 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.3 [A5 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.3 [A5 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.3 [C1 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.3 [C2 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.3 [D1 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
dbed1 [A1 1F]	Bedroom	3672	110	29	3285	32	15	Pass
dbed1 [A1 2F]	Bedroom	3672	110	35	3285	32	18	Pass
dbed1 [A1 3F]	Bedroom	3672	110	36	3285	32	18	Pass
dbed1 [A1 4F]	Bedroom	3672	110	37	3285	32	18	Pass
dbed1 [A1 GF]	Bedroom	3672	110	1	3285	32	9	Pass
dbed1 [A2 1F]	Bedroom	3672	110	37	3285	32	15	Pass
dbed1 [A2 2F]	Bedroom	3672	110	43	3285	32	17	Pass
dbed1 [A2 3F]	Bedroom	3672	110	51	3285	32	19	Pass
dbed1 [A2 4F]	Bedroom	3672	110	55	3285	32	17	Pass
dbed1 [A2 GF]	Bedroom	3672	110	26	3285	32	112	Fail
dbed1 [A4 GF]	Bedroom	3672	110	71	3285	32	115	Fail
dbed1 [A5 1F]	Bedroom	3672	110	47	3285	32	14	Pass
dbed1 [A5 2F]	Bedroom	3672	110	48	3285	32	14	Pass
dbed1 [A5 4F]	Bedroom	3672	110	41	3285	32	19	Pass
dbed1 [A5 GF]	Bedroom	3672	110	84	3285	32	143	Fail
dbed1 [A6 1F]	Bedroom	3672	110	38	3285	32	19	Pass
dbed1 [A6 2F]	Bedroom	3672	110	38	3285	32	20	Pass
dbed1 [A6 3F]	Bedroom	3672	110	41	3285	32	20	Pass
dbed1 [C1 1F]	Bedroom	3672	110	56	3285	32	16	Pass
dbed1 [C2 1F]	Bedroom	3672	110	65	3285	32	24	Pass
dbed1 [D1 1F]	Bedroom	3672	110	43	3285	32	16	Pass
dbed2 [A1 1F]	Bedroom	3672	110	38	3285	32	17	Pass
dbed2 [A1 2F]	Bedroom	3672	110	40	3285	32	20	Pass
dbed2 [A1 3F]	Bedroom	3672	110	40	3285	32	20	Pass
dbed2 [A1 4F]	Bedroom	3672	110	27	3285	32	18	Pass
dbed2 [A1 GF]	Bedroom	3672	110	22	3285	32	12	Pass
dbed2 [A2 1F]	Bedroom	3672	110	46	3285	32	18	Pass
dbed2 [A2 2F]	Bedroom	3672	110	50	3285	32	18	Pass
dbed2 [A2 3F]	Bedroom	3672	110	57	3285	32	20	Pass
dbed2 [A2 4F]	Bedroom	3672	110	53	3285	32	17	Pass
dbed2 [A2 GF]	Bedroom	3672	110	53	3285	32	114	Fail
dbed2 [A4 GF]	Bedroom	3672	110	75	3285	32	110	Fail
dbed2 [A5 1F]	Bedroom	3672	110	49	3285	32	16	Pass

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dbed2 [A5 2F]	Bedroom	3672	110	50	3285	32	16	Pass
dbed2 [A5 4F]	Bedroom	3672	110	52	3285	32	20	Pass
dbed2 [A5 GF]	Bedroom	3672	110	108	3285	32	164	Fail
dbed2 [A6 1F]	Bedroom	3672	110	47	3285	32	19	Pass
dbed2 [A6 2F]	Bedroom	3672	110	45	3285	32	20	Pass
dbed2 [A6 3F]	Bedroom	3672	110	46	3285	32	20	Pass
dbed2 [C1 1F]	Bedroom	3672	110	73	3285	32	16	Pass
dbed2 [C2 1F]	Bedroom	3672	110	77	3285	32	19	Pass
dbed3 [C1 1F]	Bedroom	3672	110	60	3285	32	22	Pass
dbed3 [C2 1F]	Bedroom	3672	110	81	3285	32	19	Pass
dbed [A3 1F]	Bedroom	3672	110	66	3285	32	25	Pass
dbed [A3 2F]	Bedroom	3672	110	70	3285	32	23	Pass
dbed [A3 3F]	Bedroom	3672	110	70	3285	32	23	Pass
dbed [A3 4F]	Bedroom	3672	110	14	3285	32	15	Pass
dbed [A3 GF]	Bedroom	3672	110	145	3285	32	196	Fail
dbed [A4 1F]	Bedroom	3672	110	24	3285	32	18	Pass
dbed [A4 2F]	Bedroom	3672	110	27	3285	32	18	Pass
dbed [A4 3F]	Bedroom	3672	110	32	3285	32	19	Pass
dbed [A4 4F]	Bedroom	3672	110	57	3285	32	16	Pass
dbed [A5 3F]	Bedroom	3672	110	68	3285	32	21	Pass
dbed [A6 GF]	Bedroom	3672	110	2	3285	32	13	Pass
dbed [A7 1F]	Bedroom	3672	110	33	3285	32	19	Pass
dbed [A7 2F]	Bedroom	3672	110	38	3285	32	22	Pass
dbed [A7 3F]	Bedroom	3672	110	36	3285	32	23	Pass
dbed [D1 2F]	Bedroom	3672	110	32	3285	32	16	Pass
dbed [D1 3F]	Bedroom	3672	110	32	3285	32	17	Pass
dbed [D2 1F]	Bedroom	3672	110	95	3285	32	16	Pass
dbed [D2 2F]	Bedroom	3672	110	100	3285	32	17	Pass
dbed [D2 3F]	Bedroom	3672	110	131	3285	32	19	Fail
kit.3 [C1 GF]	Living Room / Kitchen	1989	59	38	N/A	N/A	N/A	Pass
kit.3 [C2 GF]	Living Room / Kitchen	1989	59	55	N/A	N/A	N/A	Pass
liv.3 [C1 GF]	Living Room / Kitchen	1989	59	43	N/A	N/A	N/A	Pass
liv.3 [C2 GF]	Living Room / Kitchen	1989	59	74	N/A	N/A	N/A	Fail
liv/kit.1 [A3 1F]	Living Room / Kitchen	1989	59	82	N/A	N/A	N/A	Fail
liv/kit.1 [A3 2F]	Living Room / Kitchen	1989	59	90	N/A	N/A	N/A	Fail
liv/kit.1 [A3 3F]	Living Room / Kitchen	1989	59	92	N/A	N/A	N/A	Fail
liv/kit.1 [A3 4F]	Living Room / Kitchen	1989	59	127	N/A	N/A	N/A	Fail
liv/kit.1 [A3 GF]	Living Room / Kitchen	1989	59	60	N/A	N/A	N/A	Fail
liv/kit.1 [A4 1F]	Living Room / Kitchen	1989	59	149	N/A	N/A	N/A	Fail
liv/kit.1 [A4 2F]	Living Room / Kitchen	1989	59	137	N/A	N/A	N/A	Fail
liv/kit.1 [A4 3F]	Living Room / Kitchen	1989	59	135	N/A	N/A	N/A	Fail
liv/kit.1 [A4 4F]	Living Room / Kitchen	1989	59	109	N/A	N/A	N/A	Fail
liv/kit.1 [A6 GF]	Living Room / Kitchen	1989	59	57	N/A	N/A	N/A	Pass
liv/kit.1 [A7 1F]	Living Room / Kitchen	1989	59	95	N/A	N/A	N/A	Fail
liv/kit.1 [A7 2F]	Living Room / Kitchen	1989	59	102	N/A	N/A	N/A	Fail
liv/kit.1 [A7 3F]	Living Room / Kitchen	1989	59	93	N/A	N/A	N/A	Fail

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liv/kit.1 [D1 1F]	Living Room / Kitchen	1989	59	58	N/A	N/A	N/A	Pass
liv/kit.1 [D1 2F]	Living Room / Kitchen	1989	59	48	N/A	N/A	N/A	Pass
liv/kit.1 [D1 3F]	Living Room / Kitchen	1989	59	47	N/A	N/A	N/A	Pass
liv/kit.1 [D2 1F]	Living Room / Kitchen	1989	59	97	N/A	N/A	N/A	Fail
liv/kit.1 [D2 2F]	Living Room / Kitchen	1989	59	68	N/A	N/A	N/A	Fail
liv/kit.1 [D2 3F]	Living Room / Kitchen	1989	59	79	N/A	N/A	N/A	Fail
liv/kit.2 [A1 1F]	Living Room / Kitchen	1989	59	63	N/A	N/A	N/A	Fail
liv/kit.2 [A1 2F]	Living Room / Kitchen	1989	59	68	N/A	N/A	N/A	Fail
liv/kit.2 [A1 3F]	Living Room / Kitchen	1989	59	59	N/A	N/A	N/A	Pass
liv/kit.2 [A1 GF]	Living Room / Kitchen	1989	59	52	N/A	N/A	N/A	Pass
liv/kit.2 [A2 1F]	Living Room / Kitchen	1989	59	60	N/A	N/A	N/A	Fail
liv/kit.2 [A2 2F]	Living Room / Kitchen	1989	59	77	N/A	N/A	N/A	Fail
liv/kit.2 [A2 3F]	Living Room / Kitchen	1989	59	77	N/A	N/A	N/A	Fail
liv/kit.2 [A2 GF]	Living Room / Kitchen	1989	59	50	N/A	N/A	N/A	Pass
liv/kit.2 [A5 3F]	Living Room / Kitchen	1989	59	77	N/A	N/A	N/A	Fail
liv/kit.2 [A5 4F]	Living Room / Kitchen	1989	59	136	N/A	N/A	N/A	Fail
liv/kit.2 [A5 GF]	Living Room / Kitchen	1989	59	116	N/A	N/A	N/A	Fail
liv/kit.2 [A6 1F]	Living Room / Kitchen	1989	59	120	N/A	N/A	N/A	Fail
liv/kit.2 [A6 2F]	Living Room / Kitchen	1989	59	119	N/A	N/A	N/A	Fail
liv/kit.2 [A6 3F]	Living Room / Kitchen	1989	59	121	N/A	N/A	N/A	Fail
liv/kit.3 [A1 4F]	Living Room / Kitchen	1989	59	64	N/A	N/A	N/A	Fail
liv/kit.3 [A2 4F]	Living Room / Kitchen	1989	59	75	N/A	N/A	N/A	Fail
liv/kit.3 [A4 GF]	Living Room / Kitchen	1989	59	95	N/A	N/A	N/A	Fail
liv/kit.3 [A5 1F]	Living Room / Kitchen	1989	59	60	N/A	N/A	N/A	Fail
liv/kit.3 [A5 2F]	Living Room / Kitchen	1989	59	55	N/A	N/A	N/A	Pass
sbed [A1 4F]	Bedroom	3672	110	48	3285	32	12	Pass
sbed [A2 4F]	Bedroom	3672	110	64	3285	32	14	Pass
sbed [A4 GF]	Bedroom	3672	110	100	3285	32	106	Fail
sbed [A5 1F]	Bedroom	3672	110	72	3285	32	10	Pass
sbed [A5 2F]	Bedroom	3672	110	73	3285	32	10	Pass
sbed [A5 3F]	Bedroom	3672	110	77	3285	32	16	Pass
Utility2 [C1 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
Utility2 [C2 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
Utility [C1 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
Utility [C2 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
GF Communal Corridors 2 (4.1m)	Other	0	0	0	N/A	N/A	N/A	Pass
GF Communal Corridors 3 (2.6m)	Other	0	0	0	N/A	N/A	N/A	Pass
GF Communal Corridors 4 (6m)	Other	0	0	0	N/A	N/A	N/A	Pass
GF Communal Corridors 5 (4m)	Other	0	0	0	N/A	N/A	N/A	Pass
Studio flat (bed/living/kitchen) [D1 GF]	Bedroom	3672	110	26	3285	32	129	Fail

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Studio WC [D1 GF]	Other	0	0	0	N/A	N/A	N/A	Pass

*Zone name's that have an orange coloured font are bedrooms which do not have 24/7 365 days a year occupancy, as per the

4.4“TM59 DSY3 24hr vent 100% FA windows”

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Project Details

Building Designer File (.tbd): HN_Resi new_London_LHR_DSY3.tbd
Simulation Results File (.tsd): HN_Resi new_London_LHR_DSY3.tsd
Date: 29 January 2019
Building Category: Category II

Natural Ventilation Overheating Results

Zone Name	Room Use	Occupied Summer Hours	Max. Exceedable Hours	Criterion 1: #Hours Exceeding Comfort Range	Annual Night Occupied Hours for Bedroom	Max Exceedable Night Hours	Criterion 2: Number of Night Hours Exceeding 26 °C for Bedrooms.	Result
1F Communal Corridors 1 (7.5m)	Other	0	0	0	N/A	N/A	N/A	Pass
1F Communal Corridors 2 (4m)	Other	0	0	0	N/A	N/A	N/A	Pass
1F Communal Corridors 3 (2.6m)	Other	0	0	0	N/A	N/A	N/A	Pass
1F Communal Corridors 4 (6m)	Other	0	0	0	N/A	N/A	N/A	Pass
1F Communal Corridors 5 (4m)	Other	0	0	0	N/A	N/A	N/A	Pass
2F Communal Corridors 1 (7.5m)	Other	0	0	0	N/A	N/A	N/A	Pass
2F Communal Corridors 2 (4m)	Other	0	0	0	N/A	N/A	N/A	Pass
2F Communal Corridors 3 (2.6m)	Other	0	0	0	N/A	N/A	N/A	Pass
2F Communal Corridors 4 (6m)	Other	0	0	0	N/A	N/A	N/A	Pass
2F Communal Corridors 5 (4m)	Other	0	0	0	N/A	N/A	N/A	Pass
3F Communal Corridors 1 (7.5m)	Other	0	0	0	N/A	N/A	N/A	Pass
3F Communal Corridors 2 (4m)	Other	0	0	0	N/A	N/A	N/A	Pass
3F Communal Corridors 3 (2.6m)	Other	0	0	0	N/A	N/A	N/A	Pass
3F Communal Corridors 4 (6m)	Other	0	0	0	N/A	N/A	N/A	Pass
3F Communal Corridors 5 (4m)	Other	0	0	0	N/A	N/A	N/A	Pass
4F Communal Corridors 1 (5m)	Other	0	0	0	N/A	N/A	N/A	Pass

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4F Communal Corridors 2 (10.5m)	Other	0	0	0	N/A	N/A	N/A	Pass
bath2.2 [A1 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath2.2 [A1 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath2.2 [A1 3F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath2.2 [A1 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
bath2.2 [A2 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath2.2 [A2 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath2.2 [A2 3F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath2.2 [A2 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
bath2.2 [A5 4F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath2.2 [A6 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath2.2 [A6 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath2.2 [A6 3F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath2.3 [A1 4F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath2.3 [A2 4F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath2.3 [A4 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
bath2.3 [A5 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath2.3 [A5 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath2.3 [C1 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath2.3 [C2 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath3.3 [C1 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
bath3.3 [C2 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.1 [A3 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.1 [A3 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.1 [A3 3F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.1 [A3 4F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.1 [A3 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.1 [A4 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.1 [A4 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.1 [A4 3F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.1 [A4 4F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.1 [A6 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.1 [A7 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.1 [A7 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.1 [A7 3F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.1 [D1 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.1 [D1 3F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.1 [D2 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.1 [D2 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.1 [D2 3F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.2 [A1 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.2 [A1 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.2 [A1 3F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.2 [A1 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.2 [A2 1F]	Other	0	0	0	N/A	N/A	N/A	Pass

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bath.2 [A2 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.2 [A2 3F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.2 [A2 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.2 [A5 3F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.2 [A5 4F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.2 [A5 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.2 [A6 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.2 [A6 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.2 [A6 3F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.3 [A1 4F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.3 [A2 4F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.3 [A4 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.3 [A5 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.3 [A5 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.3 [C1 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.3 [C2 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
bath.3 [D1 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor2.3 [C1 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor2.3 [C2 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor [D1 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor [D1 3F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor [D2 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor [D2 3F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.1 [A3 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.1 [A3 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.1 [A3 3F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.1 [A3 4F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.1 [A3 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.1 [A4 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.1 [A4 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.1 [A4 3F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.1 [A4 4F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.1 [A6 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.1 [A7 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.1 [A7 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.1 [A7 3F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.1 [D2 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.2 [A1 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.2 [A1 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.2 [A1 3F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.2 [A1 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.2 [A2 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.2 [A2 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.2 [A2 3F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.2 [A2 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.2 [A5 3F]	Other	0	0	0	N/A	N/A	N/A	Pass

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corridor.2 [A5 4F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.2 [A5 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.2 [A6 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.2 [A6 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.2 [A6 3F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.3 [A1 4F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.3 [A2 4F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.3 [A4 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.3 [A5 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.3 [A5 2F]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.3 [C1 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.3 [C2 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
corridor.3 [D1 1F]	Other	0	0	0	N/A	N/A	N/A	Pass
dbed1 [A1 1F]	Bedroom	3672	110	80	3285	32	34	Fail
dbed1 [A1 2F]	Bedroom	3672	110	85	3285	32	35	Fail
dbed1 [A1 3F]	Bedroom	3672	110	86	3285	32	36	Fail
dbed1 [A1 4F]	Bedroom	3672	110	92	3285	32	36	Fail
dbed1 [A1 GF]	Bedroom	3672	110	21	3285	32	23	Pass
dbed1 [A2 1F]	Bedroom	3672	110	55	3285	32	33	Fail
dbed1 [A2 2F]	Bedroom	3672	110	66	3285	32	33	Fail
dbed1 [A2 3F]	Bedroom	3672	110	78	3285	32	38	Fail
dbed1 [A2 4F]	Bedroom	3672	110	92	3285	32	28	Pass
dbed1 [A2 GF]	Bedroom	3672	110	74	3285	32	172	Fail
dbed1 [A4 GF]	Bedroom	3672	110	115	3285	32	171	Fail
dbed1 [A5 1F]	Bedroom	3672	110	79	3285	32	25	Pass
dbed1 [A5 2F]	Bedroom	3672	110	83	3285	32	28	Pass
dbed1 [A5 4F]	Bedroom	3672	110	115	3285	32	41	Fail
dbed1 [A5 GF]	Bedroom	3672	110	186	3285	32	234	Fail
dbed1 [A6 1F]	Bedroom	3672	110	101	3285	32	36	Fail
dbed1 [A6 2F]	Bedroom	3672	110	90	3285	32	36	Fail
dbed1 [A6 3F]	Bedroom	3672	110	104	3285	32	36	Fail
dbed1 [C1 1F]	Bedroom	3672	110	92	3285	32	27	Pass
dbed1 [C2 1F]	Bedroom	3672	110	104	3285	32	38	Fail
dbed1 [D1 1F]	Bedroom	3672	110	79	3285	32	32	Pass
dbed2 [A1 1F]	Bedroom	3672	110	94	3285	32	34	Fail
dbed2 [A1 2F]	Bedroom	3672	110	95	3285	32	35	Fail
dbed2 [A1 3F]	Bedroom	3672	110	101	3285	32	35	Fail
dbed2 [A1 4F]	Bedroom	3672	110	71	3285	32	38	Fail
dbed2 [A1 GF]	Bedroom	3672	110	50	3285	32	25	Pass
dbed2 [A2 1F]	Bedroom	3672	110	72	3285	32	34	Fail
dbed2 [A2 2F]	Bedroom	3672	110	92	3285	32	33	Fail
dbed2 [A2 3F]	Bedroom	3672	110	97	3285	32	38	Fail
dbed2 [A2 4F]	Bedroom	3672	110	85	3285	32	28	Pass
dbed2 [A2 GF]	Bedroom	3672	110	114	3285	32	174	Fail
dbed2 [A4 GF]	Bedroom	3672	110	124	3285	32	162	Fail
dbed2 [A5 1F]	Bedroom	3672	110	85	3285	32	27	Pass

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dbed2 [A5 2F]	Bedroom	3672	110	89	3285	32	27	Pass
dbed2 [A5 4F]	Bedroom	3672	110	128	3285	32	43	Fail
dbed2 [A5 GF]	Bedroom	3672	110	228	3285	32	263	Fail
dbed2 [A6 1F]	Bedroom	3672	110	116	3285	32	38	Fail
dbed2 [A6 2F]	Bedroom	3672	110	109	3285	32	37	Fail
dbed2 [A6 3F]	Bedroom	3672	110	114	3285	32	39	Fail
dbed2 [C1 1F]	Bedroom	3672	110	114	3285	32	27	Fail
dbed2 [C2 1F]	Bedroom	3672	110	117	3285	32	29	Fail
dbed3 [C1 1F]	Bedroom	3672	110	96	3285	32	36	Fail
dbed3 [C2 1F]	Bedroom	3672	110	135	3285	32	29	Fail
dbed [A3 1F]	Bedroom	3672	110	111	3285	32	42	Fail
dbed [A3 2F]	Bedroom	3672	110	116	3285	32	43	Fail
dbed [A3 3F]	Bedroom	3672	110	121	3285	32	45	Fail
dbed [A3 4F]	Bedroom	3672	110	45	3285	32	26	Pass
dbed [A3 GF]	Bedroom	3672	110	250	3285	32	282	Fail
dbed [A4 1F]	Bedroom	3672	110	51	3285	32	41	Fail
dbed [A4 2F]	Bedroom	3672	110	64	3285	32	40	Fail
dbed [A4 3F]	Bedroom	3672	110	66	3285	32	42	Fail
dbed [A4 4F]	Bedroom	3672	110	81	3285	32	27	Pass
dbed [A5 3F]	Bedroom	3672	110	115	3285	32	37	Fail
dbed [A6 GF]	Bedroom	3672	110	27	3285	32	34	Fail
dbed [A7 1F]	Bedroom	3672	110	103	3285	32	39	Fail
dbed [A7 2F]	Bedroom	3672	110	109	3285	32	46	Fail
dbed [A7 3F]	Bedroom	3672	110	108	3285	32	42	Fail
dbed [D1 2F]	Bedroom	3672	110	67	3285	32	29	Pass
dbed [D1 3F]	Bedroom	3672	110	74	3285	32	31	Pass
dbed [D2 1F]	Bedroom	3672	110	144	3285	32	27	Fail
dbed [D2 2F]	Bedroom	3672	110	137	3285	32	28	Fail
dbed [D2 3F]	Bedroom	3672	110	182	3285	32	27	Fail
kit.3 [C1 GF]	Living Room / Kitchen	1989	59	71	N/A	N/A	N/A	Fail
kit.3 [C2 GF]	Living Room / Kitchen	1989	59	86	N/A	N/A	N/A	Fail
liv.3 [C1 GF]	Living Room / Kitchen	1989	59	95	N/A	N/A	N/A	Fail
liv.3 [C2 GF]	Living Room / Kitchen	1989	59	133	N/A	N/A	N/A	Fail
liv/kit.1 [A3 1F]	Living Room / Kitchen	1989	59	147	N/A	N/A	N/A	Fail
liv/kit.1 [A3 2F]	Living Room / Kitchen	1989	59	171	N/A	N/A	N/A	Fail
liv/kit.1 [A3 3F]	Living Room / Kitchen	1989	59	178	N/A	N/A	N/A	Fail
liv/kit.1 [A3 4F]	Living Room / Kitchen	1989	59	200	N/A	N/A	N/A	Fail
liv/kit.1 [A3 GF]	Living Room / Kitchen	1989	59	121	N/A	N/A	N/A	Fail
liv/kit.1 [A4 1F]	Living Room / Kitchen	1989	59	217	N/A	N/A	N/A	Fail
liv/kit.1 [A4 2F]	Living Room / Kitchen	1989	59	205	N/A	N/A	N/A	Fail
liv/kit.1 [A4 3F]	Living Room / Kitchen	1989	59	205	N/A	N/A	N/A	Fail
liv/kit.1 [A4 4F]	Living Room / Kitchen	1989	59	155	N/A	N/A	N/A	Fail
liv/kit.1 [A6 GF]	Living Room / Kitchen	1989	59	133	N/A	N/A	N/A	Fail
liv/kit.1 [A7 1F]	Living Room / Kitchen	1989	59	209	N/A	N/A	N/A	Fail
liv/kit.1 [A7 2F]	Living Room / Kitchen	1989	59	217	N/A	N/A	N/A	Fail
liv/kit.1 [A7 3F]	Living Room / Kitchen	1989	59	205	N/A	N/A	N/A	Fail

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liv/kit.1 [D1 1F]	Living Room / Kitchen	1989	59	114	N/A	N/A	N/A	Fail
liv/kit.1 [D1 2F]	Living Room / Kitchen	1989	59	105	N/A	N/A	N/A	Fail
liv/kit.1 [D1 3F]	Living Room / Kitchen	1989	59	101	N/A	N/A	N/A	Fail
liv/kit.1 [D2 1F]	Living Room / Kitchen	1989	59	157	N/A	N/A	N/A	Fail
liv/kit.1 [D2 2F]	Living Room / Kitchen	1989	59	114	N/A	N/A	N/A	Fail
liv/kit.1 [D2 3F]	Living Room / Kitchen	1989	59	136	N/A	N/A	N/A	Fail
liv/kit.2 [A1 1F]	Living Room / Kitchen	1989	59	142	N/A	N/A	N/A	Fail
liv/kit.2 [A1 2F]	Living Room / Kitchen	1989	59	144	N/A	N/A	N/A	Fail
liv/kit.2 [A1 3F]	Living Room / Kitchen	1989	59	139	N/A	N/A	N/A	Fail
liv/kit.2 [A1 GF]	Living Room / Kitchen	1989	59	102	N/A	N/A	N/A	Fail
liv/kit.2 [A2 1F]	Living Room / Kitchen	1989	59	128	N/A	N/A	N/A	Fail
liv/kit.2 [A2 2F]	Living Room / Kitchen	1989	59	140	N/A	N/A	N/A	Fail
liv/kit.2 [A2 3F]	Living Room / Kitchen	1989	59	136	N/A	N/A	N/A	Fail
liv/kit.2 [A2 GF]	Living Room / Kitchen	1989	59	87	N/A	N/A	N/A	Fail
liv/kit.2 [A5 3F]	Living Room / Kitchen	1989	59	139	N/A	N/A	N/A	Fail
liv/kit.2 [A5 4F]	Living Room / Kitchen	1989	59	256	N/A	N/A	N/A	Fail
liv/kit.2 [A5 GF]	Living Room / Kitchen	1989	59	201	N/A	N/A	N/A	Fail
liv/kit.2 [A6 1F]	Living Room / Kitchen	1989	59	223	N/A	N/A	N/A	Fail
liv/kit.2 [A6 2F]	Living Room / Kitchen	1989	59	222	N/A	N/A	N/A	Fail
liv/kit.2 [A6 3F]	Living Room / Kitchen	1989	59	223	N/A	N/A	N/A	Fail
liv/kit.3 [A1 4F]	Living Room / Kitchen	1989	59	130	N/A	N/A	N/A	Fail
liv/kit.3 [A2 4F]	Living Room / Kitchen	1989	59	131	N/A	N/A	N/A	Fail
liv/kit.3 [A4 GF]	Living Room / Kitchen	1989	59	142	N/A	N/A	N/A	Fail
liv/kit.3 [A5 1F]	Living Room / Kitchen	1989	59	102	N/A	N/A	N/A	Fail
liv/kit.3 [A5 2F]	Living Room / Kitchen	1989	59	100	N/A	N/A	N/A	Fail
sbed [A1 4F]	Bedroom	3672	110	109	3285	32	33	Fail
sbed [A2 4F]	Bedroom	3672	110	109	3285	32	25	Pass
sbed [A4 GF]	Bedroom	3672	110	160	3285	32	155	Fail
sbed [A5 1F]	Bedroom	3672	110	120	3285	32	25	Fail
sbed [A5 2F]	Bedroom	3672	110	119	3285	32	24	Fail
sbed [A5 3F]	Bedroom	3672	110	123	3285	32	26	Fail
Utility2 [C1 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
Utility2 [C2 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
Utility [C1 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
Utility [C2 GF]	Other	0	0	0	N/A	N/A	N/A	Pass
GF Communal Corridors 2 (4.1m)	Other	0	0	0	N/A	N/A	N/A	Pass
GF Communal Corridors 3 (2.6m)	Other	0	0	0	N/A	N/A	N/A	Pass
GF Communal Corridors 4 (6m)	Other	0	0	0	N/A	N/A	N/A	Pass
GF Communal Corridors 5 (4m)	Other	0	0	0	N/A	N/A	N/A	Pass
Studio flat (bed/living/kitchen) [D1 GF]	Bedroom	3672	110	87	3285	32	203	Fail

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Studio WC [D1 GF]	Other	0	0	0	N/A	N/A	N/A	Pass

*Zone name's that have an orange coloured font are bedrooms which do not have 24/7 365 days a year occupancy, as per the