



ENERGYREPORT
building certification | compliance | testing

SUSTAINABILITY & ENERGY STATEMENT

Parkside House, De Salis Road, Uxbridge, UB10 0TG

Ash Properties

J01619

7th December 2020

Tom Pope

Registry of Amendments

Revision	Date	Amendment Details	Prepared by
V.1	07/12/20		T Pope

About Energy Report Limited

A specialist building energy and sustainability consultancy offering expertise and experience to our clients within the construction and building sectors. Offering a full inclusive service from design to completion for any energy efficiency or sustainability issue.

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1 EXECUTIVE SUMMARY

This Energy Statement investigates the options for energy efficiency measures and renewable energy generation and details the proposed solution for the development at Parkside House – London Borough of Merton. In order to meet the energy reduction requirements of the Local authorities, the development will require 6.8 kwh of Solar PV, coupled with improved thermal properties and high efficiency gas combi boilers to achieve 38.1% reduction above Part L 2013

1.1 Policy Requirements

The options are examined in the context of the local policy requirements for this site as detailed in the London Plan carbon reduction targets for new buildings.

	Requirements	Compliance Check
London Plan 5.2,5.4 & 5.7 & Local Policy DMS3 and IS2	Major residential developments are required to meet “Zero Carbon Homes” – On site 35% carbon reduction against Building Regulations Part L 2013 with the remaining emissions, up to 100%, to be offset through a contribution to the Council’s Carbon Offset Fund.	As this development is considered as a minor development (8 dwelling) the ‘zero carbon’ requirement is not applicable. Carbon reduction – the development has achieved an overall carbon reduction of 38.1% over and above Part L via a highly insulated thermal envelope, high levels of air tightness, solar PV and solar thermal installations
	All new residential development will be required to meet 19% improvement over 2013 Building regulations.	
	For major developments, connection to the existing district heating network or installation of a CHP system on site	As this development is define as a minor development, connection to the existing district heating network or installation of CHP is not required. However, a feasibility assessment has been carried out showing the existing heat networks are not within close vicinity to the site. CHP is not suitable for this minor site
Local Policy DMS3 and IS2	The implementation of sustainable design and construction measures.	The high standards of sustainable design and construction measures incorporated, including water consumption of 105 litres/person/day. Details are in section 4

1.2 Methodology and Strategies

The methodology used to determine the CO² emissions is in accordance with the London Plan's 3 step Energy Hierarchy (Policy 5.2), The table below shows the Energy Hierarchy and suggested strategies for the proposed development.

Stages	Strategies
BE LEAN Energy Efficient Design	- Improved insulated thermal envelope significantly improvement on minimum U values for Building Regulations - High level of air tightness - Use of Accredited Construction Details for all thermal bridges - Low Energy Lights throughout - Low Water consumption
BE CLEAN District Heating / communal heating / CHP	- Existing District heating network not within local vicinity. - The proposed development is considered too small for CHP - The proposed development is considered too small for communal heating
BE GREEN On-site renewable Technologies	6.8 kWhp of Solar PV Panels located on the roof

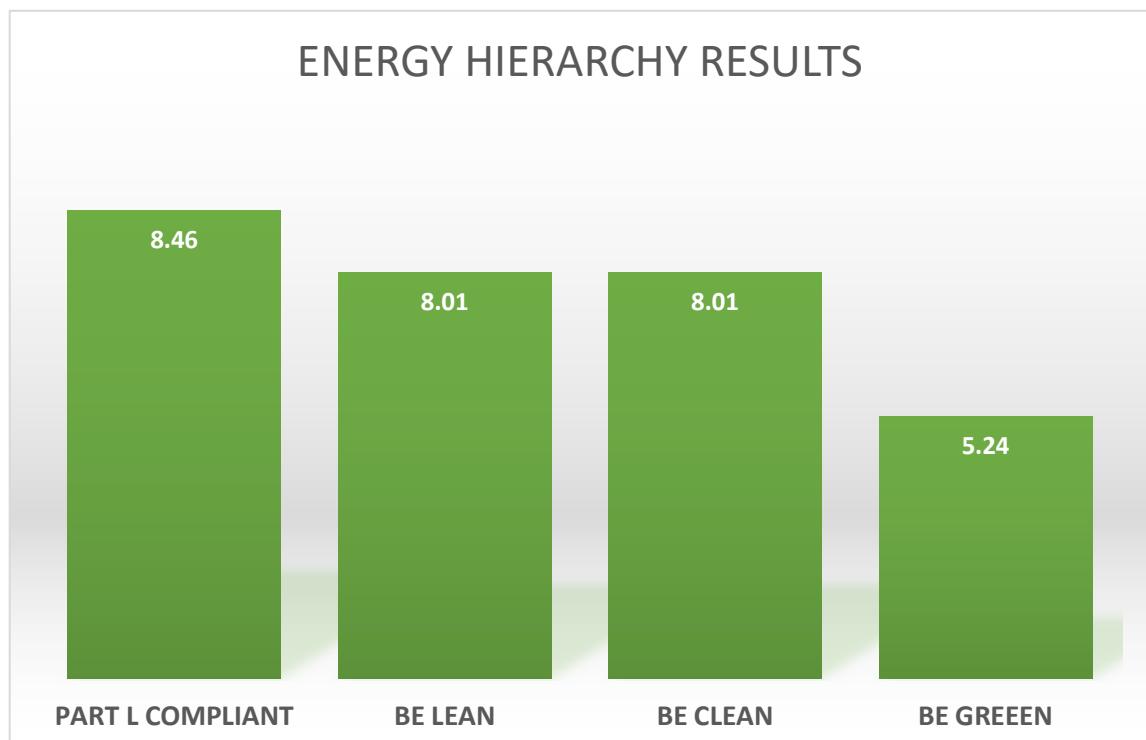
1.3 Assessment Results

After the application of all strategies based on the Energy Hierarchy, the regulated CO² have been reduced as follows:-

Energy Hierarchy		Regulated CO ² Emissions (Tonnes CO ² /yr)
BASE	TER set By Building Regulations Part L 2013	8.46
BE LEAN	After energy demand reduction	8.01
BE CLEAN	After Communal Heating / CHP	8.01
BE GREEN	After renewable energy	5.24

The carbon savings from each stage can be calculated based on the above results, the chart below summarises the total cumulative savings.

Energy Hierarchy	Regulated Carbon Savings	
	Tonnes CO ² /yr	%
BE LEAN	0.45	5.3
BE CLEAN	0	0
BE GREEN	3.22	38.1

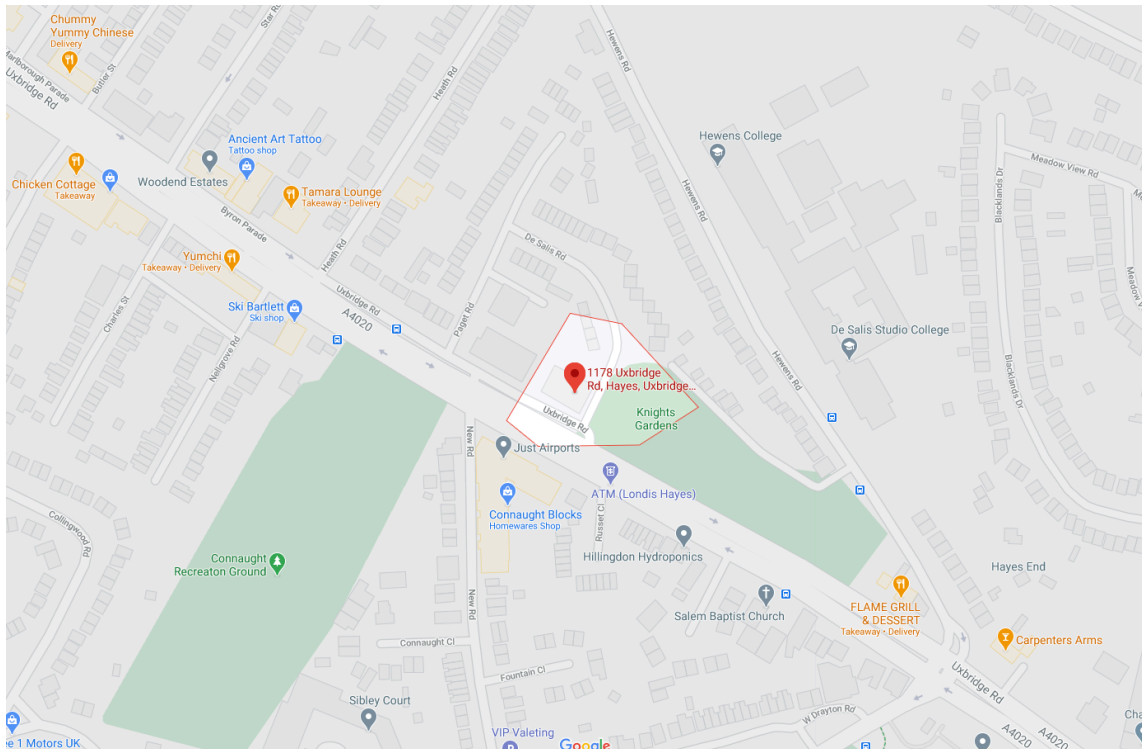


2 INTRODUCTION

- 2.1 Energy Report Limited has been commissioned by Ash Properties to provide an Energy Statement in support of the planning application for the proposed development at Parkside House, De Salis Road, Uxbridge. The Energy Statement will demonstrate how the development will comply with the CO² emissions and energy related sustainability requirements of the London Plan and the London Borough of Merton policies and guidance
- 2.2 The report outlines the energy strategy for the development in order that it achieves the maximum reduction in Regulated CO² emissions in line with the Energy Hierarchy outlined in the London Plan Energy Hierarchy
- *Be Lean* – Use less energy by improvements to the thermal fabric of the building
 - *Be Clean* – Deliver energy efficiently – De-centralised energy
 - *Be Green* – make use of renewables where applicable
- 2.3 This statement will establish the baseline energy usage and CO² emission for the development. As this is a residential development the calculations will be carried out using the SAP energy calculation model under Building Regulations Part L 2013. The statement will then outline measures to reduce the overall energy requirement *Be Lean*; identify energy efficient services that can be incorporated into the development *Be Clean*; and finally if required identify suitable renewable energy sources that are suitable for the project and have the capability of achieving the required reductions in CO² emissions *Be Green*.

3 DEVELOPMENT DESCRIPTION

- 3.1 The proposed development is located on Parkside House in the London Borough of Merton.
- 3.2 The proposed development of 8 flats to the 4th and 5th floor of an existing 3 floor residential building



4 WATER EFFICIENCY

In accordance with the London Plan SPG, a maximum water usage target has been set of 105 litres/ person / day. A design calculation is shown below for the proposed development.

Compliance Summary

Installation Type	Unit	Capacity / Flow Rate	Use Factor	Fixed Uses	Litres/ Person / Day
WCs (Single)	Flush volume (litres)		4.42	0	20.6
WCs (Dual)	Average Flush Volume (litres)	4.66			
Taps	Flow Rate (litres / minute)	3.5	1.58	1.58	7.11
Bath	Capacity to overflow (litres)	160	0.11	0	17.6
Shower	Flow Rate (litres / minute)	4.5	4.37	0	19.67
Kitchen Utility Tap	Flow Rate (litres / minute)	10.5	0.44	10.36	14.98
Washing Machine	Litres / kg dry load	8.17	2.1	0	17.16
Dishwasher	Litres / place setting	1.25	3.6	0	4.5
Waste Disposal	Litres / use		3.08	0	
Water Softner	Litres / person / day		1	0	
Grey Water					undefined
Rain Water					undefined
Total (Litres / person / day)					97.12
Normalisation Factor					0.91
Result Total (Litres / person / day)					98.03

5 PLANNING POLICES AND PROJECT REQUIREMENTS

- 5.1 National, regional and local planning policy pertinent to this energy statement considered in detail below.

National Planning Policy – National Planning Policy Framework

- 5.2 The National Planning Policy Framework (NPPF) sets out the Government's planning policies for England and how these are expected to be applied. The policies contained within the framework articulate the Government's vision of sustainable development, which should be interpreted and applied locally to meet local aspirations. The NPPF has

replaced the previous series of Planning Policy Statements (PPS) and constitutes a material consideration in planning decisions.

Regional Planning Policy - Greater London Authority Plan, 2014

- 5.3 The Spatial Development Strategy for Greater London includes objectives to reduce the capital's impact on, and exposure to the effect of climate change. Policies appropriate to the Parkside House site include:

Policy 5.2 Minimising Carbon Dioxide Emissions

- 5.4 Development proposals should make the fullest contribution 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

- 5.5 The Mayor will work with boroughs and developers to ensure that major developments meet the following targets for carbon dioxide emission reduction in buildings. These targets are expressed as minimum improvements over the Target Emission Rate (TER) outlined in the national Building Regulations. For domestic dwellings the targets are as follows:

- 2010 - 2013 25% improvement on 2010 Building Regulations
- 2013 - 2016 35% improvement on 2013 Building Regulations
- 2016- 2031 Minimum 35 % on 2013 Building Regulations to Zero Carbon

- 5.6 Major development proposal should include a detailed energy assessment to demonstrate how the target for carbon emissions reduction, outlined above, are to be met within the framework of energy hierarchy. The carbon reduction targets should be met on-site. Where it is clearly demonstrated that specific targets cannot be achieved on-site, any shortfall may be provided off-site or through a cash-in-lieu contribution to the relevant borough to be ring-fenced to secure delivery of carbon dioxide savings elsewhere.

Policy 5.3: Sustainable Design and Construction

- 5.7 Developments proposals should demonstrate that sustainable design standards are integral to the proposals, including its construction and operation, and ensure that they are considered at the beginning of the design process.

- 5.8 Major development proposals should meet the minimum standards outlines in the Mayor's supplementary planning guidance. The standards include measures to achieve other policies in this plan and the following sustainable design principles:

- Minimising carbon dioxide emissions across the site, including the building and services (such as heating and cooling systems);

- Avoiding internal overheating and contributing to the urban heat island effect;
- Efficient use of natural resources (including water), including making the most of natural systems both within and around buildings;
- Minimising pollution (including noise, air and urban run off);
- Minimising the generation of waste and maximising re-use or recycle;
- Avoiding impacts from natural hazards (including flooding);
- Ensuring developments are comfortable and secure for users, including avoiding the creation of adverse climatic conditions;
- Securing sustainable procurement of materials, using local supplies where feasible;
- Promoting and protecting biodiversity and green infrastructure.

Policy 5.6: Decentralized Energy in Development Proposals

5.9 Development proposals should evaluate the feasibility of Combined Heat and Power (CHP) systems, and where a new CHP system is appropriate also examine opportunities to extend the system beyond the site boundary to adjacent sites. Major development proposals should select energy systems in accordance with the following hierarchy:

1. Connect to existing heating or cooling networks;
2. Site wide CHP network;
3. Communal heating and cooling

5.10 Potential opportunities to connect to an existing heating or cooling network 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

5.11 Major development proposals should reduce the potential for overheating and reliance on air conditioning systems and demonstrate this in accordance with the following cooling hierarchy;

1. Minimise internal heat generation through energy efficient design;
2. Reduce the amount of heat entering a building in summer through orientation, shading, albedo, fenestration, insulation and green roofs and walls;
3. Manage the heat within a building through exposed internal thermal mass and high ceilings;
4. Passive ventilation;
5. Mechanical ventilation;
6. Active cooling systems (ensuring they are the lowest carbon options)

Policy Summary

- 5.12 This energy statement outlines how the proposed development will meet the energy requirements as specified by the London Plan and the requirements of Part L1A of the Building Regulations.
- 5.13 The proposed development at Parkside House comprises of 8 residential units, therefore the requirement to connect to a de-centralised energy network does not have to be explored for this site. The site is required to meet the London Plan Policy 5.7 Renewable Energy target for energy generation from renewable sources.
- 5.14 The Energy Statement will provide calculations for the carbon dioxide emissions and energy demand covered by Part L Conservation of Fuel and Power of the 2013 Building Regulations.
- 5.15 The London Plan hierarchy will be followed and a final recommendation for how the proposed development will meet the energy requirements outlined within the local planning policy will be given.
- 5.16 **Be Lean: use less energy:** The energy demand of the proposed domestic and non-domestic development parts, will be reduced by improving the building fabric performance, through the incorporation of energy efficiency measures
- 5.17 **Be Clean: supply energy efficiently:** Opportunities for linking into an existing or planned decentralized energy network have been explored and detailed in paragraphs below.
- 5.18 **Be Green: use renewable energy:** A percentage reduction in the carbon emission of the proposed development will be achieved through use of on-site renewable energy generation.

Energy Targets

- 5.19 The development is subject to the following key policy targets:

Minor Residential dwelling (9 dwelling or below) are required to demonstrate a 35% reduction in CO² over and above Building regulations 2013.

The Development is a new build and thus will fall under Part L1A of the building regulations for the all residential parts.

6 CALCULATION METHOD

Baseline Energy and Carbon Dioxide Emissions

- 6.01 A total baseline energy demand and carbon dioxide emissions of the entire development will be established prior to the inclusion of any measures to reduce carbon dioxide emissions. The London Plan guidance supporting Policy 5.2 'Minimising Carbon Dioxide Emission' requires that the baseline energy demand should include both the regulated energy associated with lighting, heating and hot water systems, covered by the Building Regulations
- 6.02 The estimated annual energy demand and carbon dioxide emissions for the house within the proposed development has been calculated using the Standard Assessment Procedure (SAP) methodology. SAP is the national calculation methodology accepted for the energy rating of domestic buildings, and is the preferred method accepted by the London Borough of Wandsworth.
- 6.03 SAP Calculations have been carried out on a sample flat for each of the 2 floors, the result for each sample flat is extrapolated to the total floor area for the floor sample SAP calculations can be found in Appendix A.

Floor	Floor areas				Total m ²
4th	Flat 16 - 66	Flat 17 - 79	Flat 18 - 79	Flat 19 - 69	293
5th	Flat 20 - 59	Flat 21 - 59	Flat 22 - 59	Flat 23 - 62	239

Part L 2013 Baseline

- 6.04 Table 1 shows the whole development baseline Regulated & Total CO² Emissions

Baseline Carbon Dioxide Emissions	
	Carbon Dioxide Emissions (Tonnes CO ² /yr)
	<i>Residential</i>
Part L (2013) Baseline	8.46

Be Lean – Energy Efficiency Measures

- 6.05 Minimising the requirement for energy is the first step that should be considered. The rate at which energy is lost from a building greatly influences the annual heat load, and therefore the CO² emissions and energy requirements of that building. Energy requirements for hot water applications are essentially independent of improvements to the building's fabric efficiency as these are functions of occupancy and usage rather than rate of heat loss. The main areas where the efficiency of a building can be improved are details below.

Building Fabric's Thermal Transmittance

- 6.06 Building fabric thermal transmittance is measured by the U-value of each building element in watts/m²/K. the U-value is essentially a measure of the rate at which energy is lost through a building element; the greater the U-value, the higher the rate of loss.
- 6.07 Table 2 shows the fabric performance levels assumed in relation to the minimum requirements of the 2013 Building Regulations for the development.

Building Element/Characteristic	Proposed Development	Building Regulations Part L Requirements
Exterior Walls U value	0.18 W/m ² K	0.28 W/m ² K
Floor U value	-	0.16 W/m ² K
Roof U value	0.15 W/m ² K	0.16 W/m ² K
Window U value	1.3 W/m ² K	2.0 W/m ² K
Door U value	1.6 W/m ² K	2.0 W/m ² K
Design Air Permeability	4.0	10.0

Table 2: Proposed fabric efficiency standard versus Part L1A acceptable standards

Air Permeability

- 6.08 Air Permeability is a measure of infiltration. It indicates how often the entire air quantity in a building is exchanged with outside air within 1 hour without any ventilation in place. Any air exchange with outside air is carrying heat energy away from the building, resulting in a higher heating load. From an efficiency perspective, lower air permeability levels are desirable, however reduced air permeability.
- 6.09 As this is new build an air test is required under building regulations, a suggested air test result of 4.0 is used.

Thermal Bridging

- 6.10 Thermal bridging of junctions is the loss of heat energy through the junction between different building elements (such as a wall and window) or where a building element

changes direction (such as a corner). Such areas can result in breaks in continuity of insulation that can form 'bridges' for heat energy to escape from the building.

- 6.11 The proposed development is a new build therefore 'Accredited Thermal Bridge details' are suggested with an overall Y-value of 0.052

Thermal Mass and Solar Gain

- 6.12 Thermal Mass and passive solar gains are two related aspects of efficient building design. Thermal mass is the ability of the fabric of the building to absorb excess heat. If effectively utilized, it can reduce heating and cooling loads and, in some cases, remove the requirement to provide air conditioning.
- 6.13 Passive solar gain is the use of heat absorbed by the building to contribute towards the heating demand of that building. Passive solar gain is a complex issue requiring numerous criteria to be met in order to be effective. Correct orientation as well as correct integration of glazed areas and high thermal mass elements is essential. High thermal mass elements typically have a far higher environmental impact than low thermal mass. The benefits of passive solar gain must be carefully weighed against the environmental cost and design restrictions imposed upon a development.
- 6.14 The proposed development takes into account use of the benefits of thermal and solar gain wherever possible.

Space Heating and Hot Water

- 6.15 Through improvements to the fabric efficiency and thermal properties the space heating requirement has been reduced.
- 6.16 The flats will use modern high efficiency gas fired combi condensing boiler
- 6.17 Hot water provision to be supplied by gas combi boiler

Lighting and Appliances

- 6.18 High efficiency low energy lighting and controls will be specified throughout.
- 6.19 Energy efficient appliances, every effort will be made by the developer to specify efficient appliances to be installed. However, it will be the final decision of the owner to specify the appliances

Lean Case CO² Emissions

6.20 The overall effect on the demand and associated CO² emissions of incorporating the energy efficiency measures detailed above into the proposed development would be as follows:

Be Lean Carbon Dioxide Emissions	
Baseline Carbon Dioxide Emissions	
	Carbon Dioxide Emissions (Tonnes CO²/yr)
	<i>Residential</i>
Part L (2013) Baseline	8.46
After Be Lean Measures	8.01
% Reduction over baseline	5.3%

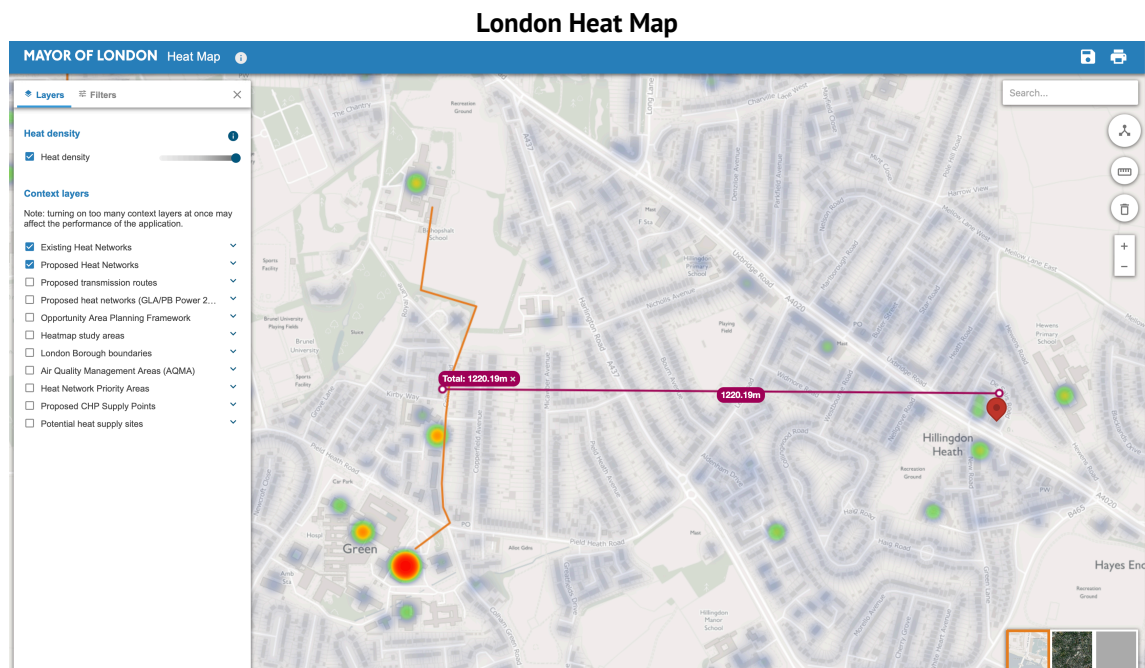
Table 3: Lean Development CO² emissions and energy requirements

6.21 The use of energy efficiency measures would reduce regulated CO² emissions in comparison to the 2013 Building Regulations Complaint case by 5.3%

6.22 Further calculations can be found in the SAP worksheets in Appendix A

BE CLEAN: Supply Energy Efficiently

- 6.23 Connection to a decentralized energy network and the use of Combined Heat and Power (CHP) is a recognized method of generating energy more efficiently. The London Plan requires all development proposals of five or more units to explore the opportunities to link into an existing or planned decentralized energy network using the London Heat Map tool.
- 6.24 The proposed development at Parkside House comprises of 8 dwellings and therefore the feasibility of connection to de-centralised energy network is required to be investigated, though a basic assessment has been explored using the London Heat Map and taking into consideration the site's location, size and design.
- 6.25 The London Heat Map is operated by the London Development Agency and details the existing and proposed major heat loads and supplies within London as well as existing and proposed heat distribution networks. The London Heat Map was consulted during the writing of this report. An extract from the London Heat map below, illustrates that the development is not located near and existing or proposed heat network. The location identified with a red location pin identifies the location of the development.



- 6.26 Based upon the information given by the London Heat Map there is no existing or proposed heat networks or suitable heat sources, or heat loads, within 1000m of the proposed development. For this reason, connection to a de-centralised heat network has been identified as unfeasible.

Be Green Carbon Dioxide Emissions	
Baseline Carbon Dioxide Emissions	
	Carbon Dioxide Emissions (Tonnes CO²/yr)
	<i>Residential</i>
After Be Lean Measures	8.01
After Be Clean Measures	5.24

On-Site CHP

6.27 For the reason outlined below, it has been concluded that on-site CHP would not be a suitable heat source for a development of this size.

- **Efficiency:** Due to the size of the development, 8 flats, the development is not of a suitable size to benefit from CHP being below 500-unit threshold the GLA has indicated for CHP
- **Cost of installation** – The base of installation of CHP is significant and would be a prohibitive cost to progress of a development of this size

6.28 Therefore it is concluded that CHP is not suitable for this development.

Community Heating

6.29 Due to the small nature of the development it is not perceived to be suitable for a community heating system.

Be Green – Low Carbon & Renewable Energy

6.30 In order to achieve the London plan and London Borough of Merton's CO² reduction target, **Be Green** measures will be required. Analysis of potential technologies is carried out below.

Biomass Boiler

6.31 Biomass boilers generate heat on a renewable basis as they are run on biomass fuel which is carbon neutral. A biomass boiler would require a central plant room and heat distribution network and would therefore be liable to high capital and running costs.

6.32 Whilst technically feasible, a biomass boiler is not appropriate for this development for

the due to the small natural of the development.

Ground and Air Source Heat Pumps (GSHPs and ASHPs)

- 6.33 Heat Pumps upgrade energy from the ground or air and utilise it for space heating, hot water and cooling. They are able to provide substantial reductions in energy.
- 6.34 However, GSHPs require costly ground excavation works to bury the coils – boreholes would be required for the proposed development due to the high space requirements of ground coils and this is not possible on this site.
- 6.35 Air Source Heat Pumps (ASHPs) are a more economical alternative to GSHPs as they do not require ground works. However, the performance of ASHPs can be lower than for GSHPs are therefore the reductions in CO₂ are correspondingly low.
- 6.36 ASHP are not considered suitable for this development

Micro Wind Turbines

- 6.37 Small rooftop wind turbines are designed to generate electricity from the wind for use within each dwelling.
- 6.38 Urban rooftop wind turbines do not generally perform sufficiently well to warrant their installation, due to the low and turbulent wind conditions present. They are therefore likely to remain technically unfeasible.
- 6.39 It has therefore been concluded that wind turbines are not a suitable technology for the proposed development.

Solar Thermal Panels

- 6.40 Solar thermal panels use the sun's energy to generate hot water for each dwelling. Due to the seasonality of solar radiation, solar thermal panels can provide up to 60% of a dwellings hot water demand, with the remainder being provided as top-up by an electric immersion heater. They are a robust technology that provides substantial benefits to residents in terms of 'free' energy. Solar thermal panels are not suitable for this project due to the complication of integrating with combi boilers

Photovoltaic Panels - Proposed Technology

- 6.41 Photovoltaic Panel have been identified as a feasible technology for incorporation into the residential development. Due to the technical and economical case for this technology plus this technology will deliver the most significant CO₂ reductions.
- 6.42 In order to achieve 35% CO₂ reduction requirement, it has been estimated that a total of

6.8kWhp Solar PV panels would have to be fitted to the roof of the building.

CO² Emissions following Be Green Measures

6.43 The table below summarises the CO² reductions achieved from all Be Lean, Be Clean and Be Green Measures. calculations can be found in the SAP worksheets in Appendix A

Be Green Carbon Dioxide Emissions	
Baseline Carbon Dioxide Emissions	
	Carbon Dioxide Emissions (Tonnes CO²/yr)
	<i>Residential</i>
After Be Lean Measures	8.01
After Be Clean Measures	8.01
After Be Green Measures	5.24

7 CONCLUSION AND SUMMARY

- 7.1 The Energy Statement outlines how the proposed development at Parkside House will meet the energy requirements as specified by the London Plan Policy 5.2 'Minimising Carbon Dioxide Emissions'.
- 7.2 This energy statement has been prepared following the principles of the London Plan Energy Hierarchy: Be Lean, Be Clean, and Be Green. In addition to the Energy Hierarchy, the Energy Statement also takes into consideration adopted London plan Policy 5.2.
- 7.3 Be Lean: The energy strategy for the development has, at its core, a reduction in energy use through adopting a high standard of building fabric performance, high levels of air tightness, which significantly exceeds the minimum requirements of Part L1A for fabric efficiency standards.
- 7.4 Be Clean: Supply Energy Efficiently requirements have been explored and discounted based upon the distance to the potential district heating network exceeding 1km and the small size of the development. These factors make the connection to the decentralised energy network unfeasible for the proposed site at Parkside House.
- 7.5 Be Green: The reduction in CO₂ required for the property as met by the installation of 6.8kWhp of PV Panels and 47 sqm of Solar PV panels.
- 7.6 CO₂ emission reduction summarized in the table below

Carbon Dioxide Emissions	
	Carbon Dioxide Emissions (Tonnes CO ₂ /yr)
	<i>Residential</i>
Part L (2013) Baseline	8.46
After Be Lean Measures	8.01
After Be Lean Measures	8.01
After Be Green Measures	5.24
% Reduction over baseline	38.1

8.0_ Disclaimer

- 8.1 Energy Report Ltd disclaims any responsibility to the Client and others in respect of any matters outside the scope of this report.
- 8.2 Energy Report Ltd accepts no responsibility whatsoever to other parties to whom this report, or any part thereof, is made known. Any such parties rely upon the report at their own risk.

APPENDIX A

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	000512			Issued on Date	07/12/2020
Assessment Reference	Lean	Prop Type Ref	4th Floor 17		
Property	Parkside House, Desalis Road, Uxbridge10 0tg, ub10 0tg				
SAP Rating	86 B	DER	13.18	TER	14.37
Environmental	90 B	% DER<TER	8.29		
CO ₂ Emissions (t/year)	0.85	DFEE	25.56	TFEE	30.44
General Requirements Compliance	Pass	% DFEE<TFEE	16.05		
Assessor Details	Mr. Thomas Pope, Energy Report Ltd, Tel: 01489 883231, tom@energyreport.co.uk			Assessor ID	f764-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

DWELLING AS DESIGNED

Mid-floor flat, total floor area 79 m²

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

1a TER and DER

Fuel for main heating: Mains gas
Fuel factor: 1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 14.37 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 13.18 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 30.4 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 25.6 kWh/m²/yr OK

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	1.30 (max. 2.00)	1.30 (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: 4.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from database
Worcester Greenstar 8000 Life GR8300iW 30 C NG
Combi boiler
Efficiency: 89.4% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Programmer, room thermostat and TRVs OK

Hot water controls: No cylinder

Boiler interlock Yes OK

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames Valley): Not significant OK
Based on:
Overshading: Average
Windows facing East: 3.36 m², No overhang
Windows facing South: 9.12 m², No overhang
Air change rate: 6.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	78.6800 (1b)	x 2.6000 (2b)	= 204.5680 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.6800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 204.5680 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour 20.0000 / (5) = 0.0978 (8)
Pressure test					Yes
Measured/design AP50					4.0000
Infiltration rate					0.2978 (18)
Number of sides sheltered					0 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		1.0000 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.2978 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
	0.3797	0.3722	0.3648	0.3275	0.3201	0.2829	0.2829	0.2754	0.2978	0.3201	0.3350	0.3499 (22b)
Effective ac	0.5721	0.5693	0.5665	0.5536	0.5512	0.5400	0.5400	0.5379	0.5443	0.5512	0.5561	0.5612 (25)

3. Heat losses and heat loss parameter

Element	Gross		Openings	NetArea	U-value	A x U	K-value	A x K					
	m2		m2	m2	W/m2K	W/K	kJ/m2K	kJ/K					
Glazing (Uw = 1.30)				12.4800	1.2357	15.4221			(27)				
External Wall 1	50.9600		12.4800	38.4800	0.1800	6.9264			(29a)				
Total net area of external elements Aum(A, m2)				50.9600					(31)				
Fabric heat loss, W/K = Sum (A x U)				(26)... (30) + (32) =		22.3485			(33)				
Party Wall 1				45.7600	0.0000	0.0000			(32)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K									250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)									5.0360 (36)				
Total fabric heat loss							(33) + (36) =	27.3845	(37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	38.6189	38.4299	38.2448	37.3750	37.2123	36.4547	36.4547	36.3144	36.7465	37.2123	37.5415	37.8856	(38)
Heat transfer coeff	66.0033	65.8144	65.6292	64.7594	64.5967	63.8392	63.8392	63.6989	64.1310	64.5967	64.9259	65.2701	(39)
Average = Sum(39)m / 12 =												64.7587	(39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.8389	0.8365	0.8341	0.8231	0.8210	0.8114	0.8114	0.8096	0.8151	0.8210	0.8252	0.8296	(40)
HLP (average)												0.8231	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4373 (42)
Average daily hot water use (litres/day)												92.0868 (43)
Daily hot water use	Jan 101.2955	Feb 97.6120	Mar 93.9285	Apr 90.2450	May 86.5616	Jun 82.8781	Jul 82.8781	Aug 86.5616	Sep 90.2450	Oct 93.9285	Nov 97.6120	Dec 101.2955 (44)
Energy conte	150.2182	131.3818	135.5743	118.1969	113.4128	97.8666	90.6878	104.0656	105.3084	122.7268	133.9659	145.4783 (45)
Energy content (annual)										Total = Sum(45)m =		1448.8836 (45)
Distribution loss (46)m = 0.15 x (45)m	22.5327	19.7073	20.3361	17.7295	17.0119	14.6800	13.6032	15.6098	15.7963	18.4090	20.0949	21.8218 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	31.9457	28.8467	31.9228	30.8765	31.8936	30.8509	31.8706	31.8855	30.8648	31.9107	30.9006	31.9409 (61)
Total heat required for water heating calculated for each month												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Solar input	182.1639	160.2285	167.4971	149.0734	145.3064	128.7175	122.5584	135.9511	136.1733	154.6376	164.8665	177.4193 (62)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	182.1639	160.2285	167.4971	149.0734	145.3064	128.7175	122.5584	135.9511	136.1733	154.6376	164.8665	177.4193 (64)
Heat gains from water heating, kWh/month	57.9340	50.8961	53.0591	47.0196	45.6832	40.2534	38.1213	42.5732	42.7313	48.7844	52.2688	56.3568 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	121.8669	121.8669	121.8669	121.8669	121.8669	121.8669	121.8669	121.8669	121.8669	121.8669	121.8669	121.8669 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.1860	17.9291	14.5809	11.0387	8.2515	6.9663	7.5273	9.7843	13.1325	16.6747	19.4618	20.7471 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	216.6596	218.9079	213.2424	201.1812	185.9560	171.6466	162.0870	159.8387	165.5043	177.5655	192.7906	207.1000 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.1867	35.1867	35.1867	35.1867	35.1867	35.1867	35.1867	35.1867	35.1867	35.1867	35.1867	35.1867 (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)	-97.4935	-97.4935	-97.4935	-97.4935	-97.4935	-97.4935	-97.4935	-97.4935	-97.4935	-97.4935	-97.4935	-97.4935 (71)
Water heating gains (Table 5)	77.8683	75.7383	71.3161	65.3050	61.4021	55.9075	51.2384	57.2220	59.3490	65.5704	72.5956	75.7484 (72)
Total internal gains	377.2740	375.1353	361.6994	340.0849	318.1697	297.0804	283.4128	289.4051	300.5458	322.3706	347.4081	366.1555 (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					3.3600	19.6403	0.6300	0.7000	0.7700			20.1678 (76)
South					9.1200	46.7521	0.6300	0.7000	0.7700			130.3069 (78)

Solar gains	150.4747	252.8616	336.8180	402.0030	436.2979	426.9978	414.2285	389.5798	359.5405	276.9955	179.6050	129.1822 (83)
Total gains	527.7487	627.9970	698.5174	742.0879	754.4677	724.0782	697.6412	678.9850	660.0862	599.3661	527.0131	495.3377 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	82.7820	83.0197	83.2539	84.3721	84.5846	85.5884	85.5884	85.7769	85.1989	84.5846	84.1558	83.7120
alpha	6.5188	6.5346	6.5503	6.6248	6.6390	6.7059	6.7059	6.7185	6.6799	6.6390	6.6104	6.5808
util living area	0.9957	0.9864	0.9611	0.8912	0.7529	0.5589	0.4021	0.4307	0.6543	0.9131	0.9879	0.9971 (86)
MIT	20.2702	20.4428	20.6451	20.8449	20.9585	20.9951	20.9995	20.9993	20.9866	20.8419	20.5156	20.2361 (87)
Th 2	20.2198	20.2218	20.2239	20.2334	20.2352	20.2435	20.2435	20.2450	20.2403	20.2352	20.2316	20.2278 (88)
util rest of house	0.9944	0.9824	0.9502	0.8640	0.7038	0.4952	0.3333	0.3605	0.5888	0.8849	0.9837	0.9961 (89)
MIT 2	19.5542	19.7263	19.9238	20.1156	20.2093	20.2413	20.2434	20.2448	20.2337	20.1183	19.8076	19.5272 (90)
Living area fraction									fLA = Living area / (4) =			0.3813 (91)
MIT	19.8272	19.9995	20.1988	20.3937	20.4950	20.5287	20.5317	20.5325	20.5208	20.3942	20.0776	19.7975 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.6772	19.8495	20.0488	20.2437	20.3450	20.3787	20.3817	20.3825	20.3708	20.2442	19.9276	19.6475 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9932	0.9801	0.9474	0.8644	0.7112	0.5068	0.3459	0.3733	0.6004	0.8853	0.9816	0.9952 (94)
Useful gains	524.1559	615.4902	661.7507	641.4670	536.5523	366.9318	241.2909	253.4660	396.2837	530.5972	517.3183	492.9823 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1014.9466	983.8911	889.1969	734.6111	558.4362	368.9090	241.4191	253.6791	402.1515	622.9838	832.8405	1008.2565 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	365.1483	247.5654	169.2200	67.0637	16.2816	0.0000	0.0000	0.0000	0.0000	68.7356	227.1760	383.3640 (98)
Space heating												1544.5546 (98)
Space heating per m ²										(98) / (4) =		19.6308 (99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Efficiency of main space heating system 1 (in %)												90.3000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												1710.4702 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	365.1483	247.5654	169.2200	67.0637	16.2816	0.0000	0.0000	0.0000	0.0000	68.7356	227.1760	383.3640 (98)
Space heating efficiency (main heating system 1)	90.3000	90.3000	90.3000	90.3000	90.3000	0.0000	0.0000	0.0000	0.0000	90.3000	90.3000	90.3000 (210)
Space heating fuel (main heating system)	404.3724	274.1588	187.3976	74.2677	18.0306	0.0000	0.0000	0.0000	0.0000	76.1191	251.5792	424.5448 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating requirement	182.1639	160.2285	167.4971	149.0734	145.3064	128.7175	122.5584	135.9511	136.1733	154.6376	164.8665	177.4193 (64)
Efficiency of water heater (217)m	89.5900	89.4631	89.2430	88.8411	88.4072	88.2000	88.2000	88.2000	88.2000	88.8357	89.4048	89.6249 (217)
Fuel for water heating, kWh/month	203.3306	179.1002	187.6865	167.7979	164.3605	145.9382	138.9551	154.1396	154.3915	174.0714	184.4045	197.9576 (219)
Water heating fuel used												2052.1335 (219)
Annual totals kWh/year												
Space heating fuel - main system												1710.4702 (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)												356.4919 (232)
Total delivered energy for all uses												4194.0955 (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	1710.4702	0.2160	369.4616 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2052.1335	0.2160	443.2608 (264)
Space and water heating			812.7224 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	356.4919	0.5190	185.0193 (268)
Total CO2, kg/year			1036.6667 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			13.1800 (273)

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

DER		13.1800 ZC1
Total Floor Area	TFA	78.6800
Assumed number of occupants	N	2.4373
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.3177 ZC2
CO2 emissions from cooking, equation (L16)		2.2559 ZC3
Total CO2 emissions		31.7537 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		31.7537 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	78.6800 (1b)	x 2.6000 (2b)	= 204.5680 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.6800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 204.5680 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1467 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3967 (18)
Number of sides sheltered					0 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3967 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.5057	0.4958	0.4859	0.4363	0.4264	0.3768	0.3768	0.3669	0.3967	0.4264	0.4462	0.4661 (22b)
Effective ac	0.6279	0.6229	0.6180	0.5952	0.5909	0.5710	0.5710	0.5673	0.5787	0.5909	0.5996	0.6086 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opening Type (Uw = 1.40)			12.4800	1.3258	16.5455		(27)
External Wall 1	50.9600	12.4800	38.4800	0.1800	6.9264		(29a)
Total net area of external elements Aum(A, m ²)			50.9600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.4719		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							3.4040 (36)
Total fabric heat loss						(33) + (36) =	26.8759 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	42.3866	42.0514	41.7228	40.1795	39.8907	38.5465	38.5465
Heat transfer coeff	69.2625	68.9273	68.5987	67.0553	66.7666	65.4223	65.4223
Average = Sum(39)m / 12 =							
HLP	0.8803	0.8760	0.8719	0.8523	0.8486	0.8315	0.8315
HLP (average)							0.8283
Days in month	31	28	31	30	31	30	31
							31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4373 (42)
Average daily hot water use (litres/day)												92.0868 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	101.2955	97.6120	93.9285	90.2450	86.5616	82.8781	82.8781	86.5616	90.2450	93.9285	97.6120	101.2955 (44)
Energy conte	150.2182	131.3818	135.5743	118.1969	113.4128	97.8666	90.6878	104.0656	105.3084	122.7268	133.9659	145.4783 (45)
Energy content (annual)										Total = Sum(45)m =		1448.8836 (45)
Distribution loss (46)m = 0.15 x (45)m	22.5327	19.7073	20.3361	17.7295	17.0119	14.6800	13.6032	15.6098	15.7963	18.4090	20.0949	21.8218 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	50.9589	44.9283	47.8649	44.5044	44.1108	40.8714	42.2338	44.1108	44.5044	47.8649	48.1374	50.9589 (61)
Total heat required for water heating calculated for each month	201.1771	176.3101	183.4392	162.7013	157.5236	138.7380	132.9216	148.1764	149.8128	170.5918	182.1034	196.4372 (62)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	201.1771	176.3101	183.4392	162.7013	157.5236	138.7380	132.9216	148.1764	149.8128	170.5918	182.1034	196.4372 (64)
Heat gains from water heating, kWh/month	62.6873	54.9165	57.0447	50.4266	48.7375	42.7585	40.7121	45.6295	46.1412	52.7729	56.5780	61.1113 (65)
Total per year (kWh/year) = Sum (64)m =												1999.9325 (64)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)m
(66)m	121.8669	121.8669	121.8669	121.8669	121.8669	121.8669	121.8669	121.8669	121.8669	121.8669	121.8669	121.8669	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.1860	17.9291	14.5809	11.0387	8.2515	6.9663	7.5273	9.7843	13.1325	16.6747	19.4618	20.7471	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	216.6596	218.9079	213.2424	201.1812	185.9560	171.6466	162.0870	159.8387	165.5043	177.5655	192.7906	207.1000	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.1867	35.1867	35.1867	35.1867	35.1867	35.1867	35.1867	35.1867	35.1867	35.1867	35.1867	35.1867	(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)	-97.4935	-97.4935	-97.4935	-97.4935	-97.4935	-97.4935	-97.4935	-97.4935	-97.4935	-97.4935	-97.4935	-97.4935	(71)
Water heating gains (Table 5)	84.2571	81.7210	76.6730	70.0369	65.5073	59.3868	54.7206	61.3300	64.0849	70.9313	78.5806	82.1388	(72)
Total internal gains	383.6629	381.1180	367.0563	344.8168	322.2750	300.5598	286.8950	293.5131	305.2817	327.7316	353.3931	372.5460	(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					3.3600	19.6403	0.6300	0.7000	0.7700		20.1678 (76)	
South					9.1200	46.7521	0.6300	0.7000	0.7700		130.3069 (78)	

Solar gains	150.4747	252.8616	336.8180	402.0030	436.2979	426.9978	414.2285	389.5798	359.5405	276.9955	179.6050	129.1822 (83)
Total gains	534.1376	633.9797	703.8743	746.8198	758.5729	727.5576	701.1235	683.0930	664.8222	604.7271	532.9981	501.7282 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	78.8867	79.2703	79.6501	81.4833	81.8357	83.5172	83.5172	83.8362	82.8614	81.8357	81.1259	80.3969	
alpha	6.2591	6.2847	6.3100	6.4322	6.4557	6.5678	6.5678	6.5891	6.5241	6.4557	6.4084	6.3598	
util living area	0.9957	0.9871	0.9642	0.8985	0.7659	0.5689	0.4099	0.4378	0.6651	0.9178	0.9882	0.9970	(86)
MIT	20.2156	20.3920	20.6026	20.8229	20.9496	20.9939	20.9994	20.9991	20.9838	20.8240	20.4836	20.1921	(87)
Th 2	20.1843	20.1879	20.1915	20.2083	20.2114	20.2261	20.2261	20.2288	20.2205	20.2114	20.2051	20.1984	(88)
util rest of house	0.9944	0.9832	0.9538	0.8719	0.7162	0.5030	0.3382	0.3650	0.5976	0.8902	0.9840	0.9960	(89)
MIT 2	19.1380	19.3959	19.6982	20.0103	20.1652	20.2223	20.2259	20.2285	20.2089	20.0201	19.5434	19.1148	(90)
Living area fraction	19.5489	19.7757	20.0430	20.3201	20.4643	20.5165	20.5208	20.5223	20.5043	20.3266	19.9019	19.5255	(92)
Temperature adjustment	19.5489	19.7757	20.0430	20.3201	20.4643	20.5165	20.5208	20.5223	20.5043	20.3266	19.9019	19.5255	(93)
adjusted MIT	19.5489	19.7757	20.0430	20.3201	20.4643	20.5165	20.5208	20.5223	20.5043	20.3266	19.9019	19.5255	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9930	0.9808	0.9516	0.8761	0.7328	0.5280	0.3655	0.3928	0.6228	0.8947	0.9820	0.9950	(94)
Ext temp.	530.4095	621.8215	669.7873	654.2518	555.8934	384.1755	256.2879	268.3146	414.0524	541.0295	523.3947	499.2182	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Month fracti	1056.1779	1025.3433	929.0352	765.7811	585.1609	387.0702	256.5084	268.6631	422.3014	649.4127	862.2174	1041.5457	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating per m ²	391.1717	271.1666	192.8804	80.3011	21.7751	0.0000	0.0000	0.0000	0.0000	80.6371	243.9524	403.4916	(98)
(98) / (4) =												21.4206	(99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	93.4000 (206)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Efficiency of secondary/supplementary heating system, %	0.0000 (208)											
Space heating requirement	1804.4711 (211)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	391.1717	271.1666	192.8804	80.3011	21.7751	0.0000	0.0000	0.0000	0.0000	80.6371	243.9524	403.4916 (98)
Space heating efficiency (main heating system 1)	93.4000	93.4000	93.4000	93.4000	93.4000	0.0000	0.0000	0.0000	0.0000	93.4000	93.4000	93.4000 (210)
Space heating fuel (main heating system)	418.8134	290.3283	206.5101	85.9754	23.3138	0.0000	0.0000	0.0000	0.0000	86.3352	261.1910	432.0039 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating requirement	201.1771	176.3101	183.4392	162.7013	157.5236	138.7380	132.9216	148.1764	149.8128	170.5918	182.1034	196.4372 (64)
Efficiency of water heater	86.6965	86.1315	85.1776	83.3783	81.4045	80.3000	80.3000	80.3000	80.3000	83.2867	85.7881	86.8242 (217)
Fuel for water heating, kWh/month	232.0475	204.6987	215.3608	195.1362	193.5071	172.7746	165.5312	184.5285	186.5664	204.8247	212.2712	226.2471 (219)
Water heating fuel used												2393.4941 (219)
Annual totals kWh/year												
Space heating fuel - main system												1804.4711 (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)												356.4919 (232)
Total delivered energy for all uses												4629.4570 (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	1804.4711	0.2160	389.7657 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2393.4941	0.2160	516.9947 (264)
Space and water heating			906.7605 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	356.4919	0.5190	185.0193 (268)
Total CO2, kg/m2/year			1130.7047 (272)
Emissions per m2 for space and water heating			11.5247 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3515 (272b)
Emissions per m2 for pumps and fans			0.4947 (272c)
Target Carbon Dioxide Emission Rate (TER) = (11.5247 * 1.00) + 2.3515 + 0.4947, rounded to 2 d.p.			14.3700 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	000510			Issued on Date	07/12/2020
Assessment Reference	Lean	Prop Type Ref	5th Floor 20		
Property	Parkside House, Desalis Road, Uxbridge10 0tg, ub10 0tg				
SAP Rating	84 B	DER	17.37	TER	17.77
Environmental	89 B	% DER<TER	2.24		
CO ₂ Emissions (t/year)	0.84	DFEE	33.88	TFEE	38.11
General Requirements Compliance	Pass	% DFEE<TFEE	11.09		
Assessor Details	Mr. Thomas Pope, Energy Report Ltd, Tel: 01489 883231, tom@energyreport.co.uk			Assessor ID	f764-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

DWELLING AS DESIGNED

Top-floor flat, total floor area 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
Fuel factor: 1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 17.77 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 17.37 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 38.1 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 33.9 kWh/m²/yr OK

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	0.15 (max. 0.20)	0.15 (max. 0.35)	OK
Openings	1.26 (max. 2.00)	1.30 (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: 4.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from database
Worcester Greenstar 8000 Life GR8300iW 40 C NG
Combi boiler
Efficiency: 89.3% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Programmer, room thermostat and TRVs OK

Hot water controls: No cylinder

Boiler interlock Yes OK

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames Valley): Not significant OK
Based on:
Overshading: Average
Windows facing East: 2.40 m², No overhang
Air change rate: 6.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	59.4000 (1b)	x 2.4000 (2b)	= 142.5600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	59.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 142.5600 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					20.0000 / (5) = 0.1403 (8)
Measured/design AP50					Yes
Infiltration rate					4.0000
Number of sides sheltered					0.3403 (18)
					0 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3403 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4339	0.4254	0.4169	0.3743	0.3658	0.3233	0.3233	0.3148	0.3403	0.3658	0.3828	0.3998 (22b)
	0.5941	0.5905	0.5869	0.5701	0.5669	0.5523	0.5523	0.5495	0.5579	0.5669	0.5733	0.5799 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Glazing (Uw = 1.30)			2.4000	1.2357	2.9658		(27)
Roof windows (Uw = 1.20)			1.4400	1.1450	1.6489		(27a)
External Wall 1	37.4400	2.4000	35.0400	0.1800	6.3072		(29a)
Main roof	59.4000	1.4400	57.9600	0.1500	8.6940		(30)
Total net area of external elements Aum(A, m ²)			96.8400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	19.6158		(33)
Party Wall 1			45.7600	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.0360 (36)
Total fabric heat loss						(33) + (36) =	24.6518 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	27.9504	27.7784	27.6099	26.8183	26.6702	25.9807	25.9807	25.8530	26.2463	26.6702	26.9698	27.2830 (38)
Heat transfer coeff	52.6022	52.4303	52.2617	51.4701	51.3220	50.6325	50.6325	50.5048	50.8981	51.3220	51.6216	51.9349 (39)
Average = Sum(39)m / 12 =												51.4694 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.8856	0.8827	0.8798	0.8665	0.8640	0.8524	0.8524	0.8502	0.8569	0.8640	0.8691	0.8743 (40)
HLP (average)												0.8665 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.9646 (42)
Average daily hot water use (litres/day)												80.8597 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	88.9457	85.7113	82.4769	79.2425	76.0081	72.7737	72.7737	76.0081	79.2425	82.4769	85.7113	88.9457 (44)
Energy conte	131.9039	115.3640	119.0453	103.7866	99.5857	85.9349	79.6313	91.3781	92.4694	107.7642	117.6331	127.7419 (45)
Energy content (annual)												Total = Sum(45)m = 1272.2383 (45)
Distribution loss (46)m = 0.15 x (45)m	19.7856	17.3046	17.8568	15.5680	14.9379	12.8902	11.9447	13.7067	13.8704	16.1646	17.6450	19.1613 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Combi loss	32.1211	29.0055	32.1020	31.0536	32.0795	31.0339	32.0617	32.0732	31.0447	32.0927	31.0722	32.1174 (61)
Total heat required for water heating calculated for each month	164.0250	144.3695	151.1473	134.8402	131.6652	116.9688	111.6930	123.4513	123.5141	139.8569	148.7053	159.8593 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	164.0250	144.3695	151.1473	134.8402	131.6652	116.9688	111.6930	123.4513	123.5141	139.8569	148.7053	159.8593 (64)
Heat gains from water heating, kWh/month	51.8883	45.6099	47.6081	42.2724	41.1321	36.3318	34.4928	38.4015	38.5073	43.8548	46.8810	50.5035 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	98.2310	98.2310	98.2310	98.2310	98.2310	98.2310	98.2310	98.2310	98.2310	98.2310	98.2310	98.2310 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.9100	16.7957	13.6592	10.3409	7.7299	6.5259	7.0515	9.1658	12.3023	15.6206	18.2316	19.4355 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	171.4312	173.2101	168.7273	159.1839	147.1371	135.8148	128.2508	126.4719	130.9547	140.4981	152.5449	163.8672 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.8231	32.8231	32.8231	32.8231	32.8231	32.8231	32.8231	32.8231	32.8231	32.8231	32.8231	32.8231 (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)	-78.5848	-78.5848	-78.5848	-78.5848	-78.5848	-78.5848	-78.5848	-78.5848	-78.5848	-78.5848	-78.5848	-78.5848 (71)
Water heating gains (Table 5)	69.7424	67.8719	63.9893	58.7117	55.2851	50.4609	46.3613	51.6149	53.4823	58.9446	65.1126	67.8811 (72)
Total internal gains	315.5529	313.3470	301.8451	283.7058	265.6214	248.2709	237.1329	242.7219	252.2086	270.5326	291.3583	306.6531 (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				2.4000	19.6403	0.6300	0.7000	0.7700	14.4056 (76)			
North				1.0800	15.6897	0.6300	0.7000	1.0000	6.7254 (82)			
Horizontal				0.3600	26.0000	0.6300	0.7000	1.0000	3.7150 (82)			
Solar gains	24.8460	48.5111	82.7415	129.8345	170.2699	179.9438	168.9485	137.1299	98.7971	58.0350	30.8886	20.5316 (83)
Total gains	340.3988	361.8580	384.5866	413.5403	435.8913	428.2147	406.0814	379.8518	351.0057	328.5675	322.2469	327.1847 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	78.4188	78.6759	78.9297	80.1436	80.3749	81.4694	81.4694	81.6753	81.0443	80.3749	79.9084	79.4264	
alpha	6.2279	6.2451	6.2620	6.3429	6.3583	6.4313	6.4313	6.4450	6.4030	6.3583	6.3272	6.2951	
util living area	0.9983	0.9971	0.9929	0.9737	0.9000	0.7217	0.5433	0.6014	0.8652	0.9819	0.9965	0.9987 (86)	
MIT	20.1053	20.1967	20.3749	20.6330	20.8582	20.9749	20.9964	20.9935	20.9206	20.6479	20.3394	20.0915 (87)	
Th 2	20.1798	20.1823	20.1847	20.1961	20.1982	20.2081	20.2081	20.2100	20.2043	20.1982	20.1939	20.1894 (88)	
util rest of house	0.9978	0.9962	0.9904	0.9638	0.8644	0.6464	0.4484	0.5034	0.8069	0.9733	0.9952	0.9983 (89)	
MIT 2	19.3564	19.4497	19.6288	19.8912	20.0992	20.1962	20.2072	20.2080	20.1584	19.9100	19.6019	19.3507 (90)	
Living area fraction	19.7094	19.8018	19.9805	20.2409	20.4570	20.5633	20.5792	20.5783	20.5177	20.2578	19.9496	19.6999 (92)	
Temperature adjustment												-0.1500	
adjusted MIT	19.5594	19.6518	19.8305	20.0909	20.3070	20.4133	20.4292	20.4283	20.3677	20.1078	19.7996	19.5499 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9972	0.9953	0.9890	0.9622	0.8698	0.6668	0.4753	0.5311	0.8203	0.9721	0.9943	0.9978 (94)
Ext temp.	339.4591	360.1747	380.3572	397.9098	379.1280	285.5408	193.0061	201.7411	287.9204	319.3856	320.4048	326.4747 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Month fracti	802.6802	773.4419	696.6731	575.9958	441.7267	294.3399	193.8821	203.4467	319.0145	487.9586	655.5726	797.1965 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating per m2	344.6365	277.7155	235.3390	128.2219	46.5735	0.0000	0.0000	0.0000	0.0000	125.4183	241.3207	350.2170 (98)
												1749.4424 (98)
												29.4519 (99)

8c. Space cooling requirement

Not applicable

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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 %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1939.5149 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	344.6365	277.7155	235.3390	128.2219	46.5735	0.0000	0.0000	0.0000	0.0000	125.4183	241.3207	350.2170	(98)
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000	(210)
Space heating fuel (main heating system)	382.0804	307.8886	260.9079	142.1529	51.6336	0.0000	0.0000	0.0000	0.0000	139.0447	267.5396	388.2672	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	164.0250	144.3695	151.1473	134.8402	131.6652	116.9688	111.6930	123.4513	123.5141	139.8569	148.7053	159.8593	(64)
Efficiency of water heater	89.5452	89.5058	89.4071	89.1636	88.7140	88.2000	88.2000	88.2000	88.2000	89.1344	89.4269	89.5635	(216)
Fuel for water heating, kWh/month	183.1756	161.2963	169.0550	151.2278	148.4153	132.6177	126.6361	139.9675	140.0387	156.9056	166.2870	178.4871	(219)
Water heating fuel used												1854.1097	(219)
Annual totals kWh/year													
Space heating fuel - main system												1939.5149	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													75.0000 (231)
Electricity for lighting (calculated in Appendix L)													333.9562 (232)
Total delivered energy for all uses													4202.5807 (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	1939.5149	0.2160	418.9352 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1854.1097	0.2160	400.4877 (264)
Space and water heating			819.4229 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	333.9562	0.5190	173.3232 (268)
Total CO2, kg/year			1031.6712 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			17.3700 (273)

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

DER		17.3700 ZC1
Total Floor Area	TFA	59.4000
Assumed number of occupants	N	1.9646
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		17.1021 ZC2
CO2 emissions from cooking, equation (L16)		2.7972 ZC3
Total CO2 emissions		37.2693 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		37.2693 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	59.4000 (1b)	x 2.4000 (2b)	= 142.5600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	59.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 142.5600 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					20.0000 / (5) = 0.1403 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3903 (18)
Number of sides sheltered					0 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3903 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4976	0.4879	0.4781	0.4293	0.4196	0.3708	0.3708	0.3610	0.3903	0.4196	0.4391	0.4586 (22b)
Effective ac	0.6238	0.6190	0.6143	0.5922	0.5880	0.5687	0.5687	0.5652	0.5762	0.5880	0.5964	0.6052 (25)

3. Heat losses and heat loss parameter

Element	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 Opening Type (Uw = 1.40)			2.4000	1.3258	3.1818		(27)					
TER Room Window (Uw = 1.70)			1.4400	1.5918	2.2921		(27a)					
External Wall 1	37.4400	2.4000	35.0400	0.1800	6.3072		(29a)					
Main roof	59.4000	1.4400	57.9600	0.1300	7.5348		(30)					
Total net area of external elements Aum(A, m2)			96.8400				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 19.3160		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								3.4040 (36)				
Total fabric heat loss								(33) + (36) = 22.7200 (37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 29.3472	Feb 29.1210	Mar 28.8993	Apr 27.8580	May 27.6631	Jun 26.7562	Jul 26.7562	Aug 26.5882	Sep 27.1055	Oct 27.6631	Nov 28.0573	Dec 28.4693 (38)
Heat transfer coeff	52.0672	51.8410	51.6193	50.5779	50.3831	49.4761	49.4761	49.3082	49.8255	50.3831	50.7772	51.1893 (39)
Average = Sum(39)m / 12 =												50.5770 (39)
HLP	Jan 0.8766	Feb 0.8727	Mar 0.8690	Apr 0.8515	May 0.8482	Jun 0.8329	Jul 0.8329	Aug 0.8301	Sep 0.8388	Oct 0.8482	Nov 0.8548	Dec 0.8618 (40)
HLP (average)												0.8515 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.9646 (42)
Average daily hot water use (litres/day)												80.8597 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	88.9457	85.7113	82.4769	79.2425	76.0081	72.7737	72.7737	76.0081	79.2425	82.4769	85.7113	88.9457 (44)
Energy conte	131.9039	115.3640	119.0453	103.7866	99.5857	85.9349	79.6313	91.3781	92.4694	107.7642	117.6331	127.7419 (45)
Energy content (annual)											Total = Sum(45)m =	1272.2383 (45)
Distribution loss (46)m = 0.15 x (45)m	19.7856	17.3046	17.8568	15.5680	14.9379	12.8902	11.9447	13.7067	13.8704	16.1646	17.6450	19.1613 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	45.3258	39.4507	42.0293	39.0785	38.7329	35.8884	37.0847	38.7329	39.0785	42.0293	42.2686	45.3258 (61)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total heat required for water heating calculated for each month	177.2296	154.8147	161.0746	142.8651	138.3186	121.8233	116.7160	130.1110	131.5479	149.7935	159.9016	173.0676 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	177.2296	154.8147	161.0746	142.8651	138.3186	121.8233	116.7160	130.1110	131.5479	149.7935	159.9016	173.0676 (64)
Heat gains from water heating, kWh/month	55.1895	48.2212	50.0899	44.2787	42.7955	37.5455	35.7486	40.0664	40.5157	46.3389	49.6801	53.8056 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	98.2310	98.2310	98.2310	98.2310	98.2310	98.2310	98.2310	98.2310	98.2310	98.2310	98.2310	98.2310 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.9100	16.7957	13.6592	10.3409	7.7299	6.5259	7.0515	9.1658	12.3023	15.6206	18.2316	19.4355 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	171.4312	173.2101	168.7273	159.1839	147.1371	135.8148	128.2508	126.4719	130.9547	140.4981	152.5449	163.8672 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.8231	32.8231	32.8231	32.8231	32.8231	32.8231	32.8231	32.8231	32.8231	32.8231	32.8231	32.8231 (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)	-78.5848	-78.5848	-78.5848	-78.5848	-78.5848	-78.5848	-78.5848	-78.5848	-78.5848	-78.5848	-78.5848	-78.5848 (71)
Water heating gains (Table 5)	74.1794	71.7577	67.3251	61.4981	57.5208	52.1465	48.0492	53.8527	56.2718	62.2835	69.0002	72.3194 (72)
Total internal gains	319.9899	317.2328	305.1809	286.4922	267.8571	249.9565	238.8207	244.9597	254.9981	273.8715	295.2459	311.0914 (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				2.4000	19.6403	0.6300	0.7000	0.7700	14.4056 (76)			
North				1.0800	15.6897	0.6300	0.7000	1.0000	6.7254 (82)			
Horizontal				0.3600	26.0000	0.6300	0.7000	1.0000	3.7150 (82)			
Solar gains	24.8460	48.5111	82.7415	129.8345	170.2699	179.9438	168.9485	137.1299	98.7971	58.0350	30.8886	20.5316 (83)
Total gains	344.8359	365.7439	387.9224	416.3267	438.1270	429.9003	407.7692	382.0896	353.7952	331.9064	326.1346	331.6230 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	79.2246	79.5703	79.9120	81.5573	81.8727	83.3736	83.3736	83.6576	82.7890	81.8727	81.2372	80.5833
alpha	6.2816	6.3047	6.3275	6.4372	6.4582	6.5582	6.5582	6.5772	6.5193	6.4582	6.4158	6.3722
util living area	0.9982	0.9969	0.9924	0.9716	0.8932	0.7076	0.5298	0.5857	0.8543	0.9801	0.9962	0.9986 (86)
MIT	20.1259	20.2173	20.3943	20.6531	20.8708	20.9791	20.9972	20.9949	20.9303	20.6676	20.3635	20.1176 (87)
Th 2	20.1875	20.1907	20.1939	20.2089	20.2118	20.2249	20.2249	20.2273	20.2198	20.2118	20.2061	20.2001 (88)
util rest of house	0.9976	0.9959	0.9897	0.9611	0.8565	0.6337	0.4387	0.4915	0.7947	0.9708	0.9947	0.9981 (89)
MIT 2	19.0099	19.1458	19.4058	19.7881	20.0804	20.2104	20.2238	20.2250	20.1615	19.8147	19.3713	19.0073 (90)
Living area fraction									fLA = Living area / (4) =			0.4714 (91)
MIT	19.5359	19.6509	19.8717	20.1958	20.4530	20.5728	20.5883	20.5879	20.5239	20.2167	19.8390	19.5307 (92)
Temperature adjustment												0.0000
adjusted MIT	19.5359	19.6509	19.8717	20.1958	20.4530	20.5728	20.5883	20.5879	20.5239	20.2167	19.8390	19.5307 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9970	0.9950	0.9884	0.9609	0.8687	0.6679	0.4818	0.5361	0.8199	0.9709	0.9938	0.9976 (94)
Useful gains	343.7934	363.9111	383.4232	400.0536	380.6155	287.1093	196.4518	204.8256	290.0665	322.2484	324.1240	330.8303 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	793.2920	764.7004	690.2392	571.3203	441.0013	295.5085	197.3275	206.4992	320.0753	484.5207	646.8534	784.7666 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	334.4270	269.3304	228.2712	123.3120	44.9270	0.0000	0.0000	0.0000	0.0000	120.7306	232.3651	337.7285 (98)
Space heating												1691.0919 (98)
Space heating per m2										(98) / (4) =		28.4696 (99)

8c. Space cooling requirement

Not applicable

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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 %)													93.4000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													1810.5909	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	334.4270	269.3304	228.2712	123.3120	44.9270	0.0000	0.0000	0.0000	0.0000	120.7306	232.3651	337.7285	(98)	
Space heating efficiency (main heating system 1)	93.4000	93.4000	93.4000	93.4000	93.4000	0.0000	0.0000	0.0000	0.0000	93.4000	93.4000	93.4000	(210)	
Space heating fuel (main heating system)	358.0589	288.3624	244.4017	132.0257	48.1017	0.0000	0.0000	0.0000	0.0000	129.2619	248.7849	361.5937	(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	177.2296	154.8147	161.0746	142.8651	138.3186	121.8233	116.7160	130.1110	131.5479	149.7935	159.9016	173.0676	(64)	
Efficiency of water heater	86.6259	86.4319	85.9287	84.6831	82.5615	80.3000	80.3000	80.3000	80.3000	84.5140	85.9911	86.7050	(216)	
(217)m	86.6259	86.4319	85.9287	84.6831	82.5615	80.3000	80.3000	80.3000	80.3000	84.5140	85.9911	86.7050	(217)	
Fuel for water heating, kWh/month	204.5919	179.1174	187.4515	168.7055	167.5339	151.7102	145.3499	162.0311	163.8206	177.2411	185.9514	199.6052	(219)	
Water heating fuel used												2093.1099	(219)	
Annual totals kWh/year														
Space heating fuel - main system												1810.5909	(211)	
Space heating fuel - secondary												0.0000	(215)	
Electricity for pumps and fans:														
central heating pump													30.0000	(230c)
main heating flue fan													45.0000	(230e)
Total electricity for the above, kWh/year													75.0000	(231)
Electricity for lighting (calculated in Appendix L)													333.9562	(232)
Total delivered energy for all uses													4312.6570	(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	1810.5909	0.2160	391.0876 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2093.1099	0.2160	452.1117 (264)
Space and water heating			843.1994 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	333.9562	0.5190	173.3232 (268)
Total CO2, kg/m2/year			1055.4476 (272)
Emissions per m2 for space and water heating			14.1953 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.9179 (272b)
Emissions per m2 for pumps and fans			0.6553 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.1953 * 1.00) + 2.9179 + 0.6553, rounded to 2 d.p.			17.7700 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	000512			Issued on Date	07/12/2020
Assessment Reference	Green	Prop Type Ref	4th Floor 17		
Property	Parkside House, Desalis Road, Uxbridge10 0tg, ub10 0tg				
SAP Rating	91 B	DER	8.62	TER	14.37
Environmental	94 A	% DER<TER	40.02		
CO ₂ Emissions (t/year)	0.47	DFEE	25.56	TFEE	30.44
General Requirements Compliance	Pass	% DFEE<TFEE	16.05		
Assessor Details	Mr. Thomas Pope, Energy Report Ltd, Tel: 01489 883231, tom@energyreport.co.uk			Assessor ID	f764-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

DWELLING AS DESIGNED

Mid-floor flat, total floor area 79 m²

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

1a TER and DER

Fuel for main heating: Mains gas
 Fuel factor: 1.00 (mains gas)
 Target Carbon Dioxide Emission Rate (TER) 14.37 kgCO₂/m²
 Dwelling Carbon Dioxide Emission Rate (DER) 8.62 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 30.4 kWh/m²/yr
 Dwelling Fabric Energy Efficiency (DFEE) 25.6 kWh/m²/yr OK

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	1.30 (max. 2.00)	1.30 (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: 4.00 (design value)
 Maximum 10.0 OK

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas
 Data from database
 Worcester Greenstar 8000 Life GR8300iW 30 C NG
 Combi boiler
 Efficiency: 89.4% SEDBUK2009
 Minimum: 88.0% OK

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Programmer, room thermostat and TRVs OK

Hot water controls: No cylinder

Boiler interlock Yes OK

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames Valley): Not significant OK
 Based on:
 Overshading: Average
 Windows facing East: 3.36 m², No overhang
 Windows facing South: 9.12 m², No overhang
 Air change rate: 6.00 ach
 Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
 Photovoltaic array 0.80 kW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	78.6800 (1b)	x 2.6000 (2b)	= 204.5680 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.6800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	204.5680 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour 20.0000 / (5) = 0.0978 (8)
Pressure test					Yes
Measured/design AP50					4.0000
Infiltration rate					0.2978 (18)
Number of sides sheltered					0 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		1.0000 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.2978 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.3797	0.3722	0.3648	0.3275	0.3201	0.2829	0.2829	0.2754	0.2978	0.3201	0.3350	0.3499 (22b)
Effective ac	0.5721	0.5693	0.5665	0.5536	0.5512	0.5400	0.5400	0.5379	0.5443	0.5512	0.5561	0.5612 (25)

3. Heat losses and heat loss parameter

Element	Gross		Openings	NetArea	U-value	A x U	K-value	A x K					
	m2		m2	m2	W/m2K	W/K	kJ/m2K	kJ/K					
Glazing (Uw = 1.30)				12.4800	1.2357	15.4221			(27)				
External Wall 1	50.9600		12.4800	38.4800	0.1800	6.9264			(29a)				
Total net area of external elements Aum(A, m2)				50.9600					(31)				
Fabric heat loss, W/K = Sum (A x U)				(26)... (30) + (32) =		22.3485			(33)				
Party Wall 1				45.7600	0.0000	0.0000			(32)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K									250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)									5.0360 (36)				
Total fabric heat loss							(33) + (36) =	27.3845	(37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	38.6189	38.4299	38.2448	37.3750	37.2123	36.4547	36.4547	36.3144	36.7465	37.2123	37.5415	37.8856	(38)
Heat transfer coeff	66.0033	65.8144	65.6292	64.7594	64.5967	63.8392	63.8392	63.6989	64.1310	64.5967	64.9259	65.2701	(39)
Average = Sum(39)m / 12 =												64.7587	(39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.8389	0.8365	0.8341	0.8231	0.8210	0.8114	0.8114	0.8096	0.8151	0.8210	0.8252	0.8296	(40)
Days in month												0.8231	(40)
	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4373 (42)
Average daily hot water use (litres/day)												92.0868 (43)
Daily hot water use	Jan 101.2955	Feb 97.6120	Mar 93.9285	Apr 90.2450	May 86.5616	Jun 82.8781	Jul 82.8781	Aug 86.5616	Sep 90.2450	Oct 93.9285	Nov 97.6120	Dec 101.2955 (44)
Energy conte	150.2182	131.3818	135.5743	118.1969	113.4128	97.8666	90.6878	104.0656	105.3084	122.7268	133.9659	145.4783 (45)
Energy content (annual)										Total = Sum(45)m =		1448.8836 (45)
Distribution loss (46)m = 0.15 x (45)m	22.5327	19.7073	20.3361	17.7295	17.0119	14.6800	13.6032	15.6098	15.7963	18.4090	20.0949	21.8218 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	31.9457	28.8467	31.9228	30.8765	31.8936	30.8509	31.8706	31.8855	30.8648	31.9107	30.9006	31.9409 (61)
Total heat required for water heating calculated for each month												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Solar input	182.1639	160.2285	167.4971	149.0734	145.3064	128.7175	122.5584	135.9511	136.1733	154.6376	164.8665	177.4193 (62)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	182.1639	160.2285	167.4971	149.0734	145.3064	128.7175	122.5584	135.9511	136.1733	154.6376	164.8665	177.4193 (64)
Heat gains from water heating, kWh/month	57.9340	50.8961	53.0591	47.0196	45.6832	40.2534	38.1213	42.5732	42.7313	48.7844	52.2688	56.3568 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	121.8669	121.8669	121.8669	121.8669	121.8669	121.8669	121.8669	121.8669	121.8669	121.8669	121.8669	121.8669 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.1860	17.9291	14.5809	11.0387	8.2515	6.9663	7.5273	9.7843	13.1325	16.6747	19.4618	20.7471 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	216.6596	218.9079	213.2424	201.1812	185.9560	171.6466	162.0870	159.8387	165.5043	177.5655	192.7906	207.1000 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.1867	35.1867	35.1867	35.1867	35.1867	35.1867	35.1867	35.1867	35.1867	35.1867	35.1867	35.1867 (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)	-97.4935	-97.4935	-97.4935	-97.4935	-97.4935	-97.4935	-97.4935	-97.4935	-97.4935	-97.4935	-97.4935	-97.4935 (71)
Water heating gains (Table 5)	77.8683	75.7383	71.3161	65.3050	61.4021	55.9075	51.2384	57.2220	59.3490	65.5704	72.5956	75.7484 (72)
Total internal gains	377.2740	375.1353	361.6994	340.0849	318.1697	297.0804	283.4128	289.4051	300.5458	322.3706	347.4081	366.1555 (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					3.3600	19.6403	0.6300	0.7000	0.7700			20.1678 (76)
South					9.1200	46.7521	0.6300	0.7000	0.7700			130.3069 (78)

Solar gains	150.4747	252.8616	336.8180	402.0030	436.2979	426.9978	414.2285	389.5798	359.5405	276.9955	179.6050	129.1822 (83)
Total gains	527.7487	627.9970	698.5174	742.0879	754.4677	724.0782	697.6412	678.9850	660.0862	599.3661	527.0131	495.3377 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	82.7820	83.0197	83.2539	84.3721	84.5846	85.5884	85.5884	85.7769	85.1989	84.5846	84.1558	83.7120
alpha	6.5188	6.5346	6.5503	6.6248	6.6390	6.7059	6.7059	6.7185	6.6799	6.6390	6.6104	6.5808
util living area	0.9957	0.9864	0.9611	0.8912	0.7529	0.5589	0.4021	0.4307	0.6543	0.9131	0.9879	0.9971 (86)
MIT	20.2702	20.4428	20.6451	20.8449	20.9585	20.9951	20.9995	20.9993	20.9866	20.8419	20.5156	20.2361 (87)
Th 2	20.2198	20.2218	20.2239	20.2334	20.2352	20.2435	20.2435	20.2450	20.2403	20.2352	20.2316	20.2278 (88)
util rest of house	0.9944	0.9824	0.9502	0.8640	0.7038	0.4952	0.3333	0.3605	0.5888	0.8849	0.9837	0.9961 (89)
MIT 2	19.5542	19.7263	19.9238	20.1156	20.2093	20.2413	20.2434	20.2448	20.2337	20.1183	19.8076	19.5272 (90)
Living area fraction									fLA = Living area / (4) =			0.3813 (91)
MIT	19.8272	19.9995	20.1988	20.3937	20.4950	20.5287	20.5317	20.5325	20.5208	20.3942	20.0776	19.7975 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.6772	19.8495	20.0488	20.2437	20.3450	20.3787	20.3817	20.3825	20.3708	20.2442	19.9276	19.6475 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9932	0.9801	0.9474	0.8644	0.7112	0.5068	0.3459	0.3733	0.6004	0.8853	0.9816	0.9952 (94)
Useful gains	524.1559	615.4902	661.7507	641.4670	536.5523	366.9318	241.2909	253.4660	396.2837	530.5972	517.3183	492.9823 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1014.9466	983.8911	889.1969	734.6111	558.4362	368.9090	241.4191	253.6791	402.1515	622.9838	832.8405	1008.2565 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	365.1483	247.5654	169.2200	67.0637	16.2816	0.0000	0.0000	0.0000	0.0000	68.7356	227.1760	383.3640 (98)
Space heating												1544.5546 (98)
Space heating per m2										(98) / (4) =		19.6308 (99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Efficiency of main space heating system 1 (in %)												90.3000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												1710.4702 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	365.1483	247.5654	169.2200	67.0637	16.2816	0.0000	0.0000	0.0000	0.0000	68.7356	227.1760	383.3640 (98)
Space heating efficiency (main heating system 1)	90.3000	90.3000	90.3000	90.3000	90.3000	0.0000	0.0000	0.0000	0.0000	90.3000	90.3000	90.3000 (210)
Space heating fuel (main heating system)	404.3724	274.1588	187.3976	74.2677	18.0306	0.0000	0.0000	0.0000	0.0000	76.1191	251.5792	424.5448 (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	182.1639	160.2285	167.4971	149.0734	145.3064	128.7175	122.5584	135.9511	136.1733	154.6376	164.8665	177.4193 (64)
Efficiency of water heater	89.5900	89.4631	89.2430	88.8411	88.4072	88.2000	88.2000	88.2000	88.2000	88.8357	89.4048	88.2000 (216)
Fuel for water heating, kWh/month	203.3306	179.1002	187.6865	167.7979	164.3605	145.9382	138.9551	154.1396	154.3915	174.0714	184.4045	197.9576 (219)
Water heating fuel used												2052.1335 (219)
Annual totals kWh/year												
Space heating fuel - main system												1710.4702 (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)												356.4919 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV Unit 0 (0.80 * 0.80 * 1080 * 1.00) =												-690.8958
Total delivered energy for all uses												-690.8958 (233)
												3503.1998 (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	1710.4702	0.2160	369.4616 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2052.1335	0.2160	443.2608 (264)
Space and water heating			812.7224 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	356.4919	0.5190	185.0193 (268)
Energy saving/generation technologies			
PV Unit	-690.8958	0.5190	-358.5749 (269)
Total CO2, kg/year			678.0918 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			8.6200 (273)

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

DER	8.6200 ZC1
Total Floor Area	78.6800
Assumed number of occupants	2.4373
CO2 emission factor in Table 12 for electricity displaced from grid	0.5190
CO2 emissions from appliances, equation (L14)	16.3177 ZC2
CO2 emissions from cooking, equation (L16)	2.2559 ZC3
Total CO2 emissions	27.1937 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	27.1937 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	78.6800 (1b)	x 2.6000 (2b)	= 204.5680 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.6800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 204.5680 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1467 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3967 (18)
Number of sides sheltered					0 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3967 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.5057	0.4958	0.4859	0.4363	0.4264	0.3768	0.3768	0.3669	0.3967	0.4264	0.4462	0.4661 (22b)
Effective ac	0.6279	0.6229	0.6180	0.5952	0.5909	0.5710	0.5710	0.5673	0.5787	0.5909	0.5996	0.6086 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opening Type (Uw = 1.40)			12.4800	1.3258	16.5455		(27)
External Wall 1	50.9600	12.4800	38.4800	0.1800	6.9264		(29a)
Total net area of external elements Aum(A, m ²)			50.9600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.4719		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							3.4040 (36)
Total fabric heat loss						(33) + (36) =	26.8759 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	42.3866	42.0514	41.7228	40.1795	39.8907	38.5465	38.5465
Heat transfer coeff	69.2625	68.9273	68.5987	67.0553	66.7666	65.4223	65.4223
Average = Sum(39)m / 12 =							
HLP	0.8803	0.8760	0.8719	0.8523	0.8486	0.8315	0.8315
HLP (average)							0.8283
Days in month	31	28	31	30	31	30	31
							31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4373 (42)
Average daily hot water use (litres/day)												92.0868 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	101.2955	97.6120	93.9285	90.2450	86.5616	82.8781	82.8781	86.5616	90.2450	93.9285	97.6120	101.2955 (44)
Energy conte	150.2182	131.3818	135.5743	118.1969	113.4128	97.8666	90.6878	104.0656	105.3084	122.7268	133.9659	145.4783 (45)
Energy content (annual)										Total = Sum(45)m =		1448.8836 (45)
Distribution loss (46)m = 0.15 x (45)m	22.5327	19.7073	20.3361	17.7295	17.0119	14.6800	13.6032	15.6098	15.7963	18.4090	20.0949	21.8218 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	50.9589	44.9283	47.8649	44.5044	44.1108	40.8714	42.2338	44.1108	44.5044	47.8649	48.1374	50.9589 (61)
Total heat required for water heating calculated for each month	201.1771	176.3101	183.4392	162.7013	157.5236	138.7380	132.9216	148.1764	149.8128	170.5918	182.1034	196.4372 (62)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	201.1771	176.3101	183.4392	162.7013	157.5236	138.7380	132.9216	148.1764	149.8128	170.5918	182.1034	196.4372 (64)
Heat gains from water heating, kWh/month	62.6873	54.9165	57.0447	50.4266	48.7375	42.7585	40.7121	45.6295	46.1412	52.7729	56.5780	61.1113 (65)
Total per year (kWh/year) = Sum (64)m =												1999.9325 (64)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)m
(66)m	121.8669	121.8669	121.8669	121.8669	121.8669	121.8669	121.8669	121.8669	121.8669	121.8669	121.8669	121.8669	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.1860	17.9291	14.5809	11.0387	8.2515	6.9663	7.5273	9.7843	13.1325	16.6747	19.4618	20.7471	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	216.6596	218.9079	213.2424	201.1812	185.9560	171.6466	162.0870	159.8387	165.5043	177.5655	192.7906	207.1000	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.1867	35.1867	35.1867	35.1867	35.1867	35.1867	35.1867	35.1867	35.1867	35.1867	35.1867	35.1867	(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)	-97.4935	-97.4935	-97.4935	-97.4935	-97.4935	-97.4935	-97.4935	-97.4935	-97.4935	-97.4935	-97.4935	-97.4935	(71)
Water heating gains (Table 5)	84.2571	81.7210	76.6730	70.0369	65.5073	59.3868	54.7206	61.3300	64.0849	70.9313	78.5806	82.1388	(72)
Total internal gains	383.6629	381.1180	367.0563	344.8168	322.2750	300.5598	286.8950	293.5131	305.2817	327.7316	353.3931	372.5460	(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					3.3600	19.6403	0.6300	0.7000	0.7700		20.1678 (76)	
South					9.1200	46.7521	0.6300	0.7000	0.7700		130.3069 (78)	

Solar gains	150.4747	252.8616	336.8180	402.0030	436.2979	426.9978	414.2285	389.5798	359.5405	276.9955	179.6050	129.1822 (83)
Total gains	534.1376	633.9797	703.8743	746.8198	758.5729	727.5576	701.1235	683.0930	664.8222	604.7271	532.9981	501.7282 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	78.8867	79.2703	79.6501	81.4833	81.8357	83.5172	83.5172	83.8362	82.8614	81.8357	81.1259	80.3969	
alpha	6.2591	6.2847	6.3100	6.4322	6.4557	6.5678	6.5678	6.5891	6.5241	6.4557	6.4084	6.3598	
util living area	0.9957	0.9871	0.9642	0.8985	0.7659	0.5689	0.4099	0.4378	0.6651	0.9178	0.9882	0.9970 (86)	
MIT	20.2156	20.3920	20.6026	20.8229	20.9496	20.9939	20.9994	20.9991	20.9838	20.8240	20.4836	20.1921 (87)	
Th 2	20.1843	20.1879	20.1915	20.2083	20.2114	20.2261	20.2261	20.2288	20.2205	20.2114	20.2051	20.1984 (88)	
util rest of house	0.9944	0.9832	0.9538	0.8719	0.7162	0.5030	0.3382	0.3650	0.5976	0.8902	0.9840	0.9960 (89)	
MIT 2	19.1380	19.3959	19.6982	20.0103	20.1652	20.2223	20.2259	20.2285	20.2089	20.0201	19.5434	19.1148 (90)	
Living area fraction	19.5489	19.7757	20.0430	20.3201	20.4643	20.5165	20.5208	20.5223	20.5043	20.3266	19.9019	19.5255 (92)	
Temperature adjustment	19.5489	19.7757	20.0430	20.3201	20.4643	20.5165	20.5208	20.5223	20.5043	20.3266	19.9019	19.5255 (93)	
adjusted MIT	19.5489	19.7757	20.0430	20.3201	20.4643	20.5165	20.5208	20.5223	20.5043	20.3266	19.9019	19.5255 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9930	0.9808	0.9516	0.8761	0.7328	0.5280	0.3655	0.3928	0.6228	0.8947	0.9820	0.9950 (94)	
Ext temp.	530.4095	621.8215	669.7873	654.2518	555.8934	384.1755	256.2879	268.3146	414.0524	541.0295	523.3947	499.2182 (95)	
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)	
Month fracti	1056.1779	1025.3433	929.0352	765.7811	585.1609	387.0702	256.5084	268.6631	422.3014	649.4127	862.2174	1041.5457 (97)	
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)	
Space heating per m2	391.1717	271.1666	192.8804	80.3011	21.7751	0.0000	0.0000	0.0000	0.0000	80.6371	243.9524	403.4916 (98)	
												1685.3760 (98)	
												21.4206 (99)	

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	93.4000 (206)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Efficiency of secondary/supplementary heating system, %	0.0000 (208)											
Space heating requirement	1804.4711 (211)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	391.1717	271.1666	192.8804	80.3011	21.7751	0.0000	0.0000	0.0000	0.0000	80.6371	243.9524	403.4916 (98)
Space heating efficiency (main heating system 1)	93.4000	93.4000	93.4000	93.4000	93.4000	0.0000	0.0000	0.0000	0.0000	93.4000	93.4000	93.4000 (210)
Space heating fuel (main heating system)	418.8134	290.3283	206.5101	85.9754	23.3138	0.0000	0.0000	0.0000	0.0000	86.3352	261.1910	432.0039 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating requirement	201.1771	176.3101	183.4392	162.7013	157.5236	138.7380	132.9216	148.1764	149.8128	170.5918	182.1034	196.4372 (64)
Efficiency of water heater	86.6965	86.1315	85.1776	83.3783	81.4045	80.3000	80.3000	80.3000	80.3000	83.2867	85.7881	86.8242 (217)
Fuel for water heating, kWh/month	232.0475	204.6987	215.3608	195.1362	193.5071	172.7746	165.5312	184.5285	186.5664	204.8247	212.2712	226.2471 (219)
Water heating fuel used												2393.4941 (219)
Annual totals kWh/year												
Space heating fuel - main system												1804.4711 (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)												356.4919 (232)
Total delivered energy for all uses												4629.4570 (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	1804.4711	0.2160	389.7657 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2393.4941	0.2160	516.9947 (264)
Space and water heating			906.7605 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	356.4919	0.5190	185.0193 (268)
Total CO2, kg/m2/year			1130.7047 (272)
Emissions per m2 for space and water heating			11.5247 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3515 (272b)
Emissions per m2 for pumps and fans			0.4947 (272c)
Target Carbon Dioxide Emission Rate (TER) = (11.5247 * 1.00) + 2.3515 + 0.4947, rounded to 2 d.p.			14.3700 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	000510			Issued on Date	07/12/2020
Assessment Reference	Green	Prop Type Ref	5th Floor 20		
Property	Parkside House, Desalis Road, Uxbridge10 0tg, ub10 0tg				
SAP Rating	89 B	DER	11.39	TER	17.77
Environmental	93 A	% DER<TER	35.90		
CO ₂ Emissions (t/year)	0.45	DFEE	33.88	TFEE	38.11
General Requirements Compliance	Pass	% DFEE<TFEE	11.09		
Assessor Details	Mr. Thomas Pope, Energy Report Ltd, Tel: 01489 883231, tom@energyreport.co.uk			Assessor ID	f764-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

DWELLING AS DESIGNED

Top-floor flat, total floor area 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
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 17.77 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 11.39 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)38.1 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)33.9 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	0.15 (max. 0.20)	0.15 (max. 0.35)	OK
Openings	1.26 (max. 2.00)	1.30 (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: 4.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from database
Worcester Greenstar 8000 Life GR8300iW 40 C NG
Combi boiler
Efficiency: 89.3% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Programmer, room thermostat and TRVs OK

Hot water controls: No cylinder

Boiler interlock Yes OK

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames Valley): Not significant OK
Based on:
Overshading: Average
Windows facing East: 2.40 m², No overhang
Air change rate: 6.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Photovoltaic array 0.90 kW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	59.4000 (1b)	x 2.4000 (2b)	= 142.5600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	59.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 142.5600 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) = 0.1403 (8)
Pressure test					Yes
Measured/design AP50					4.0000
Infiltration rate					0.3403 (18)
Number of sides sheltered					0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3403 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4339	0.4254	0.4169	0.3743	0.3658	0.3233	0.3233	0.3148	0.3403	0.3658	0.3828	0.3998 (22b)
Effective ac	0.5941	0.5905	0.5869	0.5701	0.5669	0.5523	0.5523	0.5495	0.5579	0.5669	0.5733	0.5799 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Glazing (Uw = 1.30)			2.4000	1.2357	2.9658		(27)
Roof windows (Uw = 1.20)			1.4400	1.1450	1.6489		(27a)
External Wall 1	37.4400	2.4000	35.0400	0.1800	6.3072		(29a)
Main roof	59.4000	1.4400	57.9600	0.1500	8.6940		(30)
Total net area of external elements Aum(A, m ²)			96.8400				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.6158		(33)
Party Wall 1			45.7600	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.0360 (36)
Total fabric heat loss						(33) + (36) =	24.6518 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	27.9504	27.7784	27.6099	26.8183	26.6702	25.9807	25.9807	25.8530	26.2463	26.6702	26.9698	27.2830 (38)
Heat transfer coeff	52.6022	52.4303	52.2617	51.4701	51.3220	50.6325	50.6325	50.5048	50.8981	51.3220	51.6216	51.9349 (39)
Average = Sum(39)m / 12 =												51.4694 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.8856	0.8827	0.8798	0.8665	0.8640	0.8524	0.8524	0.8502	0.8569	0.8640	0.8691	0.8743 (40)
HLP (average)												0.8665 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.9646 (42)
Average daily hot water use (litres/day)												80.8597 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	88.9457	85.7113	82.4769	79.2425	76.0081	72.7737	72.7737	76.0081	79.2425	82.4769	85.7113	88.9457 (44)
Energy conte	131.9039	115.3640	119.0453	103.7866	99.5857	85.9349	79.6313	91.3781	92.4694	107.7642	117.6331	127.7419 (45)
Energy content (annual)										Total = Sum(45)m =		1272.2383 (45)
Distribution loss (46)m = 0.15 x (45)m	19.7856	17.3046	17.8568	15.5680	14.9379	12.8902	11.9447	13.7067	13.8704	16.1646	17.6450	19.1613 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Combi loss	32.1211	29.0055	32.1020	31.0536	32.0795	31.0339	32.0617	32.0732	31.0447	32.0927	31.0722	32.1174 (61)
Total heat required for water heating calculated for each month	164.0250	144.3695	151.1473	134.8402	131.6652	116.9688	111.6930	123.4513	123.5141	139.8569	148.7053	159.8593 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	164.0250	144.3695	151.1473	134.8402	131.6652	116.9688	111.6930	123.4513	123.5141	139.8569	148.7053	159.8593 (64)
Heat gains from water heating, kWh/month	51.8883	45.6099	47.6081	42.2724	41.1321	36.3318	34.4928	38.4015	38.5073	43.8548	46.8810	50.5035 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	98.2310	98.2310	98.2310	98.2310	98.2310	98.2310	98.2310	98.2310	98.2310	98.2310	98.2310	98.2310 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.9100	16.7957	13.6592	10.3409	7.7299	6.5259	7.0515	9.1658	12.3023	15.6206	18.2316	19.4355 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	171.4312	173.2101	168.7273	159.1839	147.1371	135.8148	128.2508	126.4719	130.9547	140.4981	152.5449	163.8672 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.8231	32.8231	32.8231	32.8231	32.8231	32.8231	32.8231	32.8231	32.8231	32.8231	32.8231	32.8231 (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)	-78.5848	-78.5848	-78.5848	-78.5848	-78.5848	-78.5848	-78.5848	-78.5848	-78.5848	-78.5848	-78.5848	-78.5848 (71)
Water heating gains (Table 5)	69.7424	67.8719	63.9893	58.7117	55.2851	50.4609	46.3613	51.6149	53.4823	58.9446	65.1126	67.8811 (72)
Total internal gains	315.5529	313.3470	301.8451	283.7058	265.6214	248.2709	237.1329	242.7219	252.2086	270.5326	291.3583	306.6531 (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				2.4000	19.6403	0.6300	0.7000	0.7700	14.4056 (76)			
North				1.0800	15.6897	0.6300	0.7000	1.0000	6.7254 (82)			
Horizontal				0.3600	26.0000	0.6300	0.7000	1.0000	3.7150 (82)			
Solar gains	24.8460	48.5111	82.7415	129.8345	170.2699	179.9438	168.9485	137.1299	98.7971	58.0350	30.8886	20.5316 (83)
Total gains	340.3988	361.8580	384.5866	413.5403	435.8913	428.2147	406.0814	379.8518	351.0057	328.5675	322.2469	327.1847 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	78.4188	78.6759	78.9297	80.1436	80.3749	81.4694	81.4694	81.6753	81.0443	80.3749	79.9084	79.4264
alpha	6.2279	6.2451	6.2620	6.3429	6.3583	6.4313	6.4313	6.4450	6.4030	6.3583	6.3272	6.2951
util living area	0.9983	0.9971	0.9929	0.9737	0.9000	0.7217	0.5433	0.6014	0.8652	0.9819	0.9965	0.9987 (86)
MIT	20.1053	20.1967	20.3749	20.6330	20.8582	20.9749	20.9964	20.9935	20.9206	20.6479	20.3394	20.0915 (87)
Th 2	20.1798	20.1823	20.1847	20.1961	20.1982	20.2081	20.2081	20.2100	20.2043	20.1982	20.1939	20.1894 (88)
util rest of house	0.9978	0.9962	0.9904	0.9638	0.8644	0.6464	0.4484	0.5034	0.8069	0.9733	0.9952	0.9983 (89)
MIT 2	19.3564	19.4497	19.6288	19.8912	20.0992	20.1962	20.2072	20.2080	20.1584	19.9100	19.6019	19.3507 (90)
Living area fraction	19.7094	19.8018	19.9805	20.2409	20.4570	20.5633	20.5792	20.5783	20.5177	20.2578	19.9496	19.6999 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.5594	19.6518	19.8305	20.0909	20.3070	20.4133	20.4292	20.4283	20.3677	20.1078	19.7996	19.5499 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9972	0.9953	0.9890	0.9622	0.8698	0.6668	0.4753	0.5311	0.8203	0.9721	0.9943	0.9978 (94)
Ext temp.	339.4591	360.1747	380.3572	397.9098	379.1280	285.5408	193.0061	201.7411	287.9204	319.3856	320.4048	326.4747 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Month fracti	802.6802	773.4419	696.6731	575.9958	441.7267	294.3399	193.8821	203.4467	319.0145	487.9586	655.5726	797.1965 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating per m2	344.6365	277.7155	235.3390	128.2219	46.5735	0.0000	0.0000	0.0000	0.0000	125.4183	241.3207	350.2170 (98)
												1749.4424 (98)
												29.4519 (99)

8c. Space cooling requirement

Not applicable

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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 %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1939.5149 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	344.6365	277.7155	235.3390	128.2219	46.5735	0.0000	0.0000	0.0000	0.0000	125.4183	241.3207	350.2170	(98)
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000	(210)
Space heating fuel (main heating system)	382.0804	307.8886	260.9079	142.1529	51.6336	0.0000	0.0000	0.0000	0.0000	139.0447	267.5396	388.2672	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	164.0250	144.3695	151.1473	134.8402	131.6652	116.9688	111.6930	123.4513	123.5141	139.8569	148.7053	159.8593	(64)
Efficiency of water heater	89.5452	89.5058	89.4071	89.1636	88.7140	88.2000	88.2000	88.2000	88.2000	89.1344	89.4269	89.5635	(217)
Fuel for water heating, kWh/month	183.1756	161.2963	169.0550	151.2278	148.4153	132.6177	126.6361	139.9675	140.0387	156.9056	166.2870	178.4871	(219)
Water heating fuel used												1854.1097	(219)
Annual totals kWh/year													
Space heating fuel - main system												1939.5149	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												333.9562	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.90 * 951 * 1.00) =										-684.4435		-684.4435	(233)
Total delivered energy for all uses												3518.1372	(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	1939.5149	0.2160	418.9352 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1854.1097	0.2160	400.4877 (264)
Space and water heating			819.4229 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	333.9562	0.5190	173.3232 (268)
Energy saving/generation technologies			
PV Unit	-684.4435	0.5190	-355.2262 (269)
Total CO2, kg/year			676.4450 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			11.3900 (273)

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

DER			11.3900 ZC1
Total Floor Area		TFA	59.4000
Assumed number of occupants		N	1.9646
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			17.1021 ZC2
CO2 emissions from cooking, equation (L16)			2.7972 ZC3
Total CO2 emissions			31.2893 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			31.2893 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	59.4000 (1b)	x 2.4000 (2b)	= 142.5600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	59.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 142.5600 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					20.0000 / (5) = 0.1403 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3903 (18)
Number of sides sheltered					0 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3903 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4976	0.4879	0.4781	0.4293	0.4196	0.3708	0.3708	0.3610	0.3903	0.4196	0.4391	0.4586 (22b)
Effective ac	0.6238	0.6190	0.6143	0.5922	0.5880	0.5687	0.5687	0.5652	0.5762	0.5880	0.5964	0.6052 (25)

3. Heat losses and heat loss parameter

Element	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 Opening Type (Uw = 1.40)			2.4000	1.3258	3.1818		(27)					
TER Room Window (Uw = 1.70)			1.4400	1.5918	2.2921		(27a)					
External Wall 1	37.4400	2.4000	35.0400	0.1800	6.3072		(29a)					
Main roof	59.4000	1.4400	57.9600	0.1300	7.5348		(30)					
Total net area of external elements Aum(A, m2)			96.8400				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	19.3160		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								3.4040 (36)				
Total fabric heat loss								(33) + (36) = 22.7200 (37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 29.3472	Feb 29.1210	Mar 28.8993	Apr 27.8580	May 27.6631	Jun 26.7562	Jul 26.7562	Aug 26.5882	Sep 27.1055	Oct 27.6631	Nov 28.0573	Dec 28.4693 (38)
Heat transfer coeff	52.0672	51.8410	51.6193	50.5779	50.3831	49.4761	49.4761	49.3082	49.8255	50.3831	50.7772	51.1893 (39)
Average = Sum(39)m / 12 =												50.5770 (39)
HLP	Jan 0.8766	Feb 0.8727	Mar 0.8690	Apr 0.8515	May 0.8482	Jun 0.8329	Jul 0.8329	Aug 0.8301	Sep 0.8388	Oct 0.8482	Nov 0.8548	Dec 0.8618 (40)
HLP (average)												0.8515 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.9646 (42)
Average daily hot water use (litres/day)												80.8597 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	88.9457	85.7113	82.4769	79.2425	76.0081	72.7737	72.7737	76.0081	79.2425	82.4769	85.7113	88.9457 (44)
Energy conte	131.9039	115.3640	119.0453	103.7866	99.5857	85.9349	79.6313	91.3781	92.4694	107.7642	117.6331	127.7419 (45)
Energy content (annual)												Total = Sum(45)m = 1272.2383 (45)
Distribution loss (46)m = 0.15 x (45)m	19.7856	17.3046	17.8568	15.5680	14.9379	12.8902	11.9447	13.7067	13.8704	16.1646	17.6450	19.1613 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	45.3258	39.4507	42.0293	39.0785	38.7329	35.8884	37.0847	38.7329	39.0785	42.0293	42.2686	45.3258 (61)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total heat required for water heating calculated for each month	177.2296	154.8147	161.0746	142.8651	138.3186	121.8233	116.7160	130.1110	131.5479	149.7935	159.9016	173.0676 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	177.2296	154.8147	161.0746	142.8651	138.3186	121.8233	116.7160	130.1110	131.5479	149.7935	159.9016	173.0676 (64)
Heat gains from water heating, kWh/month	55.1895	48.2212	50.0899	44.2787	42.7955	37.5455	35.7486	40.0664	40.5157	46.3389	49.6801	53.8056 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	98.2310	98.2310	98.2310	98.2310	98.2310	98.2310	98.2310	98.2310	98.2310	98.2310	98.2310	98.2310 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.9100	16.7957	13.6592	10.3409	7.7299	6.5259	7.0515	9.1658	12.3023	15.6206	18.2316	19.4355 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	171.4312	173.2101	168.7273	159.1839	147.1371	135.8148	128.2508	126.4719	130.9547	140.4981	152.5449	163.8672 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.8231	32.8231	32.8231	32.8231	32.8231	32.8231	32.8231	32.8231	32.8231	32.8231	32.8231	32.8231 (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)	-78.5848	-78.5848	-78.5848	-78.5848	-78.5848	-78.5848	-78.5848	-78.5848	-78.5848	-78.5848	-78.5848	-78.5848 (71)
Water heating gains (Table 5)	74.1794	71.7577	67.3251	61.4981	57.5208	52.1465	48.0492	53.8527	56.2718	62.2835	69.0002	72.3194 (72)
Total internal gains	319.9899	317.2328	305.1809	286.4922	267.8571	249.9565	238.8207	244.9597	254.9981	273.8715	295.2459	311.0914 (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				2.4000	19.6403	0.6300	0.7000	0.7700	14.4056 (76)			
North				1.0800	15.6897	0.6300	0.7000	1.0000	6.7254 (82)			
Horizontal				0.3600	26.0000	0.6300	0.7000	1.0000	3.7150 (82)			
Solar gains	24.8460	48.5111	82.7415	129.8345	170.2699	179.9438	168.9485	137.1299	98.7971	58.0350	30.8886	20.5316 (83)
Total gains	344.8359	365.7439	387.9224	416.3267	438.1270	429.9003	407.7692	382.0896	353.7952	331.9064	326.1346	331.6230 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	79.2246	79.5703	79.9120	81.5573	81.8727	83.3736	83.3736	83.6576	82.7890	81.8727	81.2372	80.5833
alpha	6.2816	6.3047	6.3275	6.4372	6.4582	6.5582	6.5582	6.5772	6.5193	6.4582	6.4158	6.3722
util living area	0.9982	0.9969	0.9924	0.9716	0.8932	0.7076	0.5298	0.5857	0.8543	0.9801	0.9962	0.9986 (86)
MIT	20.1259	20.2173	20.3943	20.6531	20.8708	20.9791	20.9972	20.9949	20.9303	20.6676	20.3635	20.1176 (87)
Th 2	20.1875	20.1907	20.1939	20.2089	20.2118	20.2249	20.2249	20.2273	20.2198	20.2118	20.2061	20.2001 (88)
util rest of house	0.9976	0.9959	0.9897	0.9611	0.8565	0.6337	0.4387	0.4915	0.7947	0.9708	0.9947	0.9981 (89)
MIT 2	19.0099	19.1458	19.4058	19.7881	20.0804	20.2104	20.2238	20.2250	20.1615	19.8147	19.3713	19.0073 (90)
Living area fraction									fLA = Living area / (4) =			0.4714 (91)
MIT	19.5359	19.6509	19.8717	20.1958	20.4530	20.5728	20.5883	20.5879	20.5239	20.2167	19.8390	19.5307 (92)
Temperature adjustment												0.0000
adjusted MIT	19.5359	19.6509	19.8717	20.1958	20.4530	20.5728	20.5883	20.5879	20.5239	20.2167	19.8390	19.5307 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9970	0.9950	0.9884	0.9609	0.8687	0.6679	0.4818	0.5361	0.8199	0.9709	0.9938	0.9976 (94)
Useful gains	343.7934	363.9111	383.4232	400.0536	380.6155	287.1093	196.4518	204.8256	290.0665	322.2484	324.1240	330.8303 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	793.2920	764.7004	690.2392	571.3203	441.0013	295.5085	197.3275	206.4992	320.0753	484.5207	646.8534	784.7666 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	334.4270	269.3304	228.2712	123.3120	44.9270	0.0000	0.0000	0.0000	0.0000	120.7306	232.3651	337.7285 (98)
Space heating												1691.0919 (98)
Space heating per m2										(98) / (4) =		28.4696 (99)

8c. Space cooling requirement

Not applicable

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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 %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1810.5909 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	334.4270	269.3304	228.2712	123.3120	44.9270	0.0000	0.0000	0.0000	0.0000	120.7306	232.3651	337.7285	(98)
Space heating efficiency (main heating system 1)	93.4000	93.4000	93.4000	93.4000	93.4000	0.0000	0.0000	0.0000	0.0000	93.4000	93.4000	93.4000	(210)
Space heating fuel (main heating system)	358.0589	288.3624	244.4017	132.0257	48.1017	0.0000	0.0000	0.0000	0.0000	129.2619	248.7849	361.5937	(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	177.2296	154.8147	161.0746	142.8651	138.3186	121.8233	116.7160	130.1110	131.5479	149.7935	159.9016	173.0676	(64)
Efficiency of water heater	86.6259	86.4319	85.9287	84.6831	82.5615	80.3000	80.3000	80.3000	80.3000	84.5140	85.9911	86.7050	(216)
(217)m	86.6259	86.4319	85.9287	84.6831	82.5615	80.3000	80.3000	80.3000	80.3000	84.5140	85.9911	86.7050	(217)
Fuel for water heating, kWh/month	204.5919	179.1174	187.4515	168.7055	167.5339	151.7102	145.3499	162.0311	163.8206	177.2411	185.9514	199.6052	(219)
Water heating fuel used												2093.1099	(219)
Annual totals kWh/year													
Space heating fuel - main system												1810.5909	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												333.9562	(232)
Total delivered energy for all uses												4312.6570	(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	1810.5909	0.2160	391.0876 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2093.1099	0.2160	452.1117 (264)
Space and water heating			843.1994 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	333.9562	0.5190	173.3232 (268)
Total CO2, kg/m2/year			1055.4476 (272)
Emissions per m2 for space and water heating			14.1953 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.9179 (272b)
Emissions per m2 for pumps and fans			0.6553 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.1953 * 1.00) + 2.9179 + 0.6553, rounded to 2 d.p.			17.7700 (273)