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Part of the **FOCUS** consultancy group



Energy Statement
233 London Rd, Reading

28th April 2022

Newark (Head) Office:

Newark Beacon, Beacon Hill Office Park,
Cafferata Way, Newark, Notts, NG24 2TN.
Tel: 01636 653 055

London Office:

344-354 Gray's Inn Road, King's Cross,
London WC1X 8BP.
Tel: 0207 033 3757

Birmingham Office:

2nd Floor Quayside Tower, 252-260 Broad St,
Birmingham B1 2HF.
Tel: 0121 285 2785

info@mesbuildingsolutions.co.uk | www.mesbuildingsolutions.co.uk

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About MES Building Solutions

MES Building Solutions is an established consultancy practice specialising in providing building solutions throughout the UK.

We offer a full range of services for both residential and commercial buildings from small individual properties through to highly complex mixed use developments.

We are an industry leader in delivering a professional, accredited and certified service to a wide range of clients including architects, developers, builders, housing associations, the public sector and private householders.

Employing highly qualified staff, our team comes from a variety of backgrounds within the construction industry with combined knowledge of building design, engineering, assessment, construction, development, research and surveying.

We are renowned for our creative thinking and provide a high quality, honest and diligent service.

MES Building Solutions maintains its position at the forefront of changes in planning, building regulations and neighbourly matters, as well as technological advances. Our clients, large or small are therefore assured of a cost effective, cohesive and fully integrated professional service.

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Section 1: Introduction

1.1 Executive Summary

MES Building Solutions has been engaged to provide an energy and sustainability statement in order to address the requirements of Reading Council in relation to the proposed development at 233 London Road. The purpose of this energy statement is to provide an overview of how sustainability will be promoted both during and after construction and to establish the predicted energy requirements for the proposed development. It will illustrate how energy efficiency measures in conjunction with renewable generation can be used to reduce the predicted energy consumption and associated carbon dioxide emissions. It will also show how domestic potable water use will be minimised.

The applicable planning policies this report will address are detailed in the Reading Local Plan and supporting Sustainable Design and Construction SPD. The relevant policies addressed by this report are CC2, CC4 & H5. The energy and carbon requirements are addressed in Section 3 of this report with the water consumption requirements addressed in Section 4.

The energy and carbon reductions required have been achieved by following the energy hierarchy, which includes:

- Calculation of estimated baseline energy consumption & CO₂ emissions using SAP calculations
- Implementation of the energy hierarchy (be lean, be clean, be green)
- Assessment of the viability of connection to existing heat networks and/or the use of CHP
- Calculation of estimated energy consumption & CO₂ emissions at each stage of energy hierarchy
- Calculation of estimated final energy consumption & CO₂ emissions
- Calculation of reduction in emissions achieved
- Calculation of contribution from renewable, decentralised or low carbon generation, if applicable

The report is produced to accompany the detailed planning application to fulfil the current requirements of Reading Council.

In line with the favoured approach of Reading Council we have calculated the total energy requirement for the development using Part L 2013 SAP calculations for a representative sample of the apartments.

SAP10 carbon factors have then been used to calculate the resulting CO₂ emissions from the development. For the proposed development at 233 London Road the required carbon reduction has been achieved by the use of;

- Improved building fabric over the Part L 2013 baseline requirements.
- Use of ASHPs for both the space heating & DHW source

Tables 1a & 1b, below, show the modelled performance based on the SAP calculations for each stage of the Energy Hierarchy. Further details can be found in Section 3 and the appendices to this report.

	Energy Consumption (kWh per annum)	Carbon Dioxide Emissions for domestic buildings (Tonnes CO ₂ per annum)	
	Regulated	Regulated	Unregulated
Baseline: Part L 2013 of the Building Regulations Compliant Development	32,670	7	3
After energy demand reduction	29,215	6	3
After heat network / CHP	29,215	6	3
After renewable energy	14,391	3	3

Table 1a: Total reduction in energy use and carbon emissions – SAP10

	Regulated domestic carbon dioxide savings	
	(Tonnes CO ₂ per annum)	(%)
Savings from energy demand reduction	0	10%
Savings from heat network / CHP	0	0%
Savings from renewable energy	3	41%
Cumulative on site savings	4	51%

Table 1b: Total savings in regulated carbon emissions – SAP10

In line with Reading Local Plan policy H5 water efficient fittings will be specified for this development to ensure the new apartments achieve the Optional Requirement of the Building Regulations – a mains water consumption of 110 litres per person per day. For the full specification and calculation associated with this please see Section 4 and Appendix C to this report.



1.2 Planning Policy

In terms of planning policy, the relevant provisions in the Reading Local Plan are policies CC2, CC4 & H5 – which are reproduced below for information.

CC2: SUSTAINABLE DESIGN AND CONSTRUCTION

Proposals for new development, including the construction of new buildings and the redevelopment and refurbishment of existing building stock, will be acceptable where the design of buildings and site layouts use energy, water, minerals, materials and other natural resources appropriately, efficiently and with care and take account of the effects of climate change.

To meet these requirements:

- *All major non-residential developments or conversions to residential are required to meet the most up-to-date BREEAM 'Excellent' standards, where possible;*
- *All minor non-residential developments or conversions to residential are required to meet the most up-to-date BREEAM 'Very Good' standard as a minimum;*
- *All non-residential development or conversions to residential should incorporate water conservation measures so that predicted per capita consumption does not exceed the appropriate levels set out in the applicable BREEAM standard. Both residential and non-residential development should include recycling greywater and rainwater harvesting where systems are energy and cost effective.*

As this development does not include any new commercial development it is not considered that BREEAM is applicable to the scheme as proposed.

CC4: DECENTRALISED ENERGY

In meeting the sustainability requirements of this plan, developments of the sizes set out below shall demonstrate how consideration has been given to securing energy for the development from a decentralised energy source.

Any development of more than 20 dwellings and/ or non-residential development of over 1,000 sq m shall consider the inclusion of decentralised energy provision, within the site, unless it can be demonstrated that the scheme is not suitable, feasible or viable for this form of energy provision.

Where there is existing decentralised energy provision present within the vicinity of an application site, further developments of 10 dwellings or more or non-residential development of 1,000 sq m or more will be expected to link into the existing decentralised energy network or demonstrate why this is not feasible.



H5: STANDARDS FOR NEW HOUSING

New build housing should be built to the following standards, unless it can be clearly demonstrated that this would render a development unviable:

- a. All new build housing outside the Central Area as defined on the Proposals Map will comply with the nationally-described space standard.***
- b. All new build housing will be built to the higher water efficiency standard under Regulation 36(3) of the Building Regulations⁷⁹.***
- c. All major new-build residential development should be designed to achieve zero carbon homes.***
- d. All other new build housing will achieve at a minimum a 19% improvement in the dwelling emission rate over the target emission rate, as defined in the 2013 Building Regulations.***
- e. All new build housing will be accessible and adaptable in line with M4(2) of the Building Regulations, unless it is built in line with M4(3) (see below).***
- f. On developments of 20 or more new build dwellings, at least 5% of dwellings will be wheelchair user dwellings in line with M4(3) of the Building Regulations. Any market homes provided to meet this requirement will be 'wheelchair adaptable' as defined in part M, whilst homes where the Council is responsible for allocating or nominating an individual may be 'wheelchair accessible'.***

Also relevant is the Sustainable Design and Construction SPD, which was published in 2019. This provides further details on how to comply with the above policies. In particular, Table 3.1 confirms the required levels of sustainability standards for different development types – this is reproduced below;

	Size of Development	Required Standard
New-build residential	Minor (fewer than 10 dwellings)	19% improvement in the dwelling emission rate over the target emission rate, as defined in the 2013 Building Regulations
	Major (10 dwellings or more)	Zero Carbon (or if unachievable, a minimum 35% improvement in the dwelling emission rate over the target emission rate, as defined in the 2013 Building Regulations and planning contribution to offset remaining carbon emissions to zero)
Creation of new residential units through conversion from other uses and/or major refurbishment	Minor (fewer than 10 dwellings)	BREEAM 'Very Good'
	Major (10 dwellings or more)	BREEAM 'Excellent'
Non-residential development (including development for non-C3 residential)	Minor (less than 1,000 sq. m of floorspace)	BREEAM 'Very Good'
	Major (1,000 sq. m of floorspace or more)	BREEAM 'Excellent'
Non-residential refurbishment (including refurbishment for non-C3 residential)	Minor (less than 1,000 sq. m of floorspace)	BREEAM 'Very Good'
	Major (1,000 sq. m of floorspace or more)	BREEAM 'Excellent'

1.3 SAP 10

With the introduction of the new 2021 Part L in June 2022 there is a widespread acknowledgement that the SAP2012 carbon factors are now over 10 years old, and significantly out of date. The use of SAP2012 carbon factors can result in developments targeting specifications that do not achieve the required carbon reductions – for example, significantly less PV generation is required when using SAP2012 carbon factors as when using SAP10 carbon factors.

As a result of the above, and to ensure the accuracy and relevance of the proposed specification, MES have based all calculations within this report on the SAP10 carbon factors – these can be found in Table 1c, below.

Emissions kg/CO ₂ /kWh		
	Part L 2013	SAP 10
Mains Gas	0.216	0.210
Electricity	0.519	0.233

Table 1c: Part L 2013 and SAP10 emission factors



Section 2: Description of development

2.1 Location

This report is produced in support of a planning application to Reading Council for the proposed development at 233 London Road.

The site is situated to the East of the centre of Reading, with the site in close proximity to many local bus routes for onward travel. An aerial photo of the site location can be found as Figure 2.1, below.



Figure 2.1: Aerial photo of site location

2.2 Details of development

The application is for the conversion of the existing building fronting London Road from one commercial unit and one flat into one commercial unit and three flats and the provision of a new building containing three flats to the rear of the site. The development will provide 4 one bed flats and 2 two bed flats. This proposal is to be considered a minor development.

Excerpts from relevant drawings can be found in Figures 2.2 to 2.5 below.



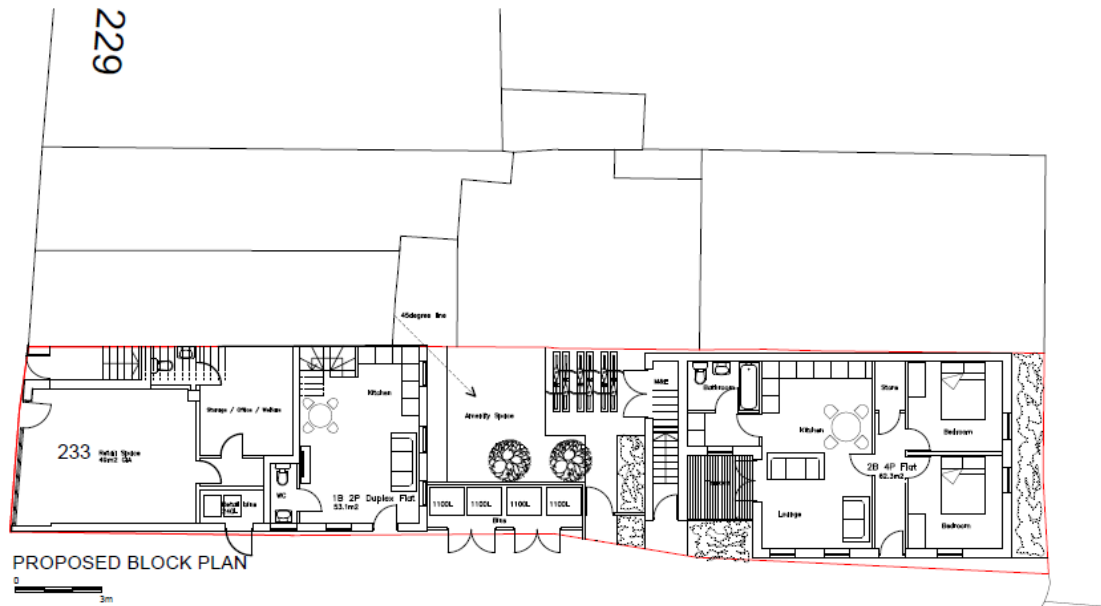


Figure 2.2: Proposed Block Plan

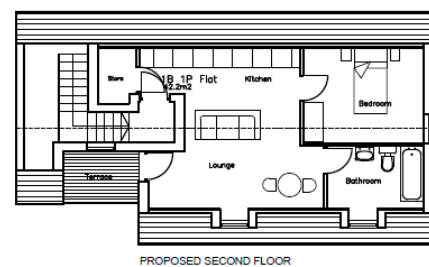
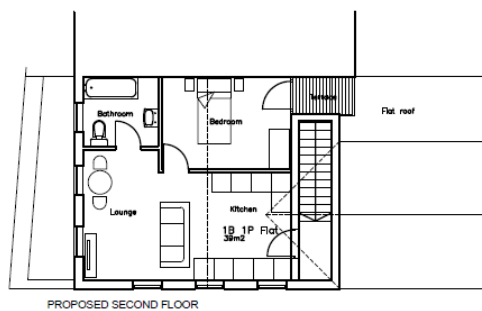
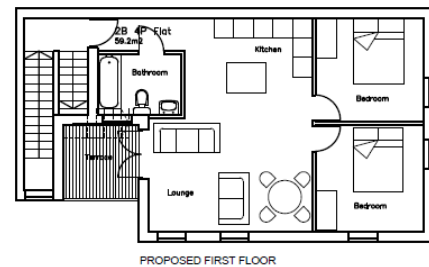
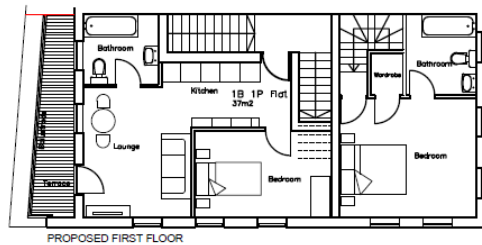
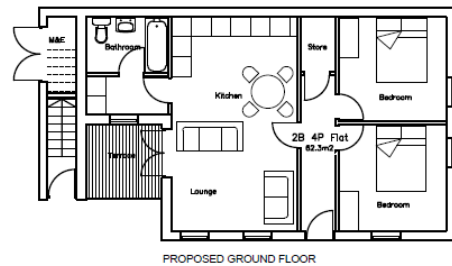
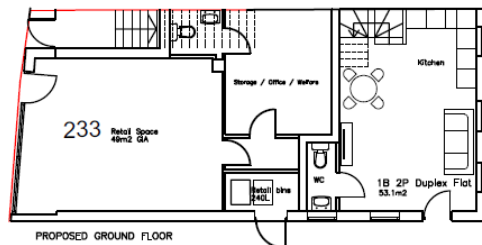


Figure 2.3: Proposed Floor Plans





Figure 2.4: Proposed Front and Rear Elevations



Figure 2.5: Proposed Side Elevations



Section 3: Energy

3.1 The Energy Hierarchy

In order to address energy efficiency the design team have adopted the energy hierarchy. The energy hierarchy is generally accepted as the most effective way of reducing a buildings' carbon emissions.

1. Be lean: use less energy
2. Be clean: supply energy efficiently
3. Be green: use renewable energy
4. Be seen: monitor, verify and report on energy performance

Development proposals should:

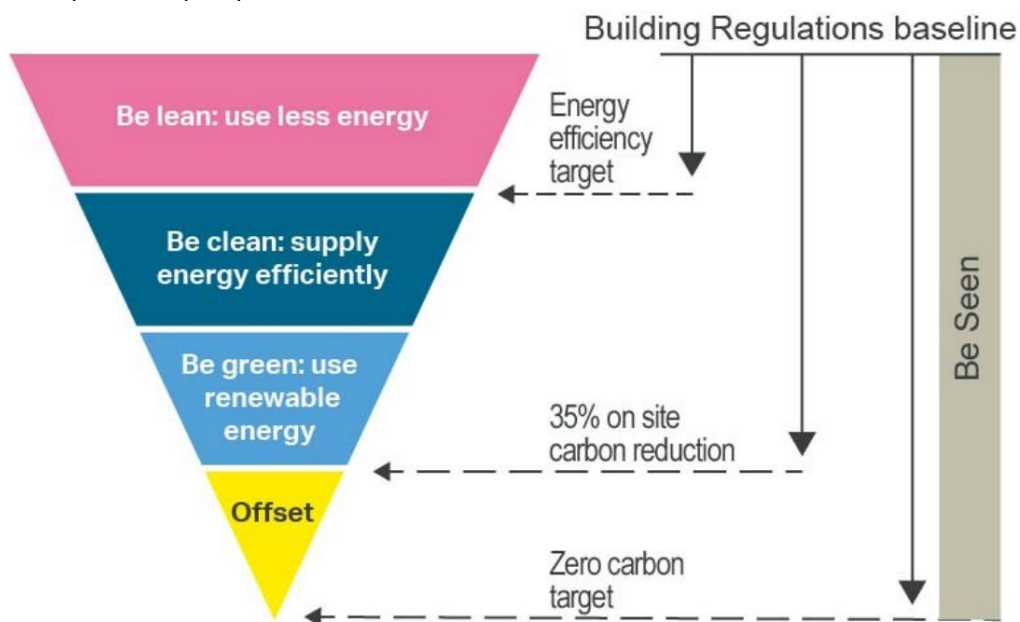


Figure 3a: The Energy Hierarchy

- **Reducing energy demand**

The first step in the process of reducing the overall energy used and CO₂ produced by the building is to minimise the energy required to heat it. A well-insulated building envelope and passive design will reduce the energy requirement for heating and ventilating the building.

- **Energy efficient systems**

The second step is to specify services and controls, lighting and appliances that are energy efficient and which result in further reduction in energy requirements.

- **Making use of Low or zero-carbon (LZC) technologies**

When the energy demand has been reduced by implementing the processes of improving the fabric and energy efficiency, then LZC

technologies can be employed to reduce the environmental impact of the remaining energy consumption.

- **Monitoring and reporting**

Ensure comprehensive monitoring and reporting of energy demand and carbon emissions. Major developments are required to undertake this process for at least five years.

3.2 Calculating Baseline Energy Demand

The first step is to calculate a Building Regulations Part L2A 2013 compliant specification in order to establish baseline emissions for the development. Calculated energy data using the government's approved methodology (SAP2012) has been used to establish baseline energy requirements which comply with the 2013 edition of Part L minimum elemental standards. To calculate the associated carbon emissions SAP10 carbon factors have been applied to the calculated energy consumption.

The baseline emissions and energy consumption figures for the flats have been taken from the Part L1A TER calculations as generated from SAP2012 modelling. As the commercial space is in the existing building and is not being enlarged its energy consumption has been omitted from consideration in this report. Full details (SAP) can be found in Appendix A and the modelled Baseline performance can be found in Table 3a, below.

	Energy Consumption (kWh per annum)	Carbon Dioxide Emissions for domestic buildings (Tonnes CO ₂ per annum)	
	Regulated	Regulated	Unregulated
Baseline: Part L 2013 of the Building Regulations Compliant Development	32,670	7	3

Table 3a: Regulated and unregulated carbon dioxide emissions (SAP10)

The strategic aim is to reduce carbon emissions overall, so that while planning decisions and monitoring requirements will be underpinned by the targets expressed above, the requirement for energy assessments to include separate details of unregulated emissions is to recognise explicitly the additional contribution that can be made through use of efficient equipment, building controls and good management practices, including green leases. Unregulated emissions are, therefore, presented above but are not taken into account when calculating percentage improvements or any carbon offset payment.



3.3 'Be Lean' – Building Fabric Improvements

The first step of the energy hierarchy looks at reducing energy consumption in the building through improvements to its fabric. This reduces the energy required to run the building and thus the emissions associated with that energy use.

The current 2013 Part L is already very stringent in terms of fabric performance targets. It can be difficult to achieve further improvements over the fabric specification used for the 'Notional Building'. As such, further opportunities for improvement to the building fabric and services beyond those which meet the current 2013 Building Regulations requirements can be very limited. However, some further improvements are possible by considering the following steps:

- Reduce elemental U-Values
- Reducing heat loss through uncontrolled ventilation (air leakage)
- Address heat loss at junctions (thermal bridging)

Element	Conversion Proposed Specification	New-Build Proposed Specification
External Walls	0.20W/m ² K	0.15-0.18W/m ² K
Walls to Corridors/ Stairwells	0.20W/m ² K	0.20W/m ² K
Party Walls	0.00W/m ² K	0.00W/m ² K
Roofs	0.10-0.11W/m ² K	0.10-0.14W/m ² K
Ground Floor	0.16W/m ² K	0.10W/m ² K
Exposed Floors	0.12W/m ² K	-
Windows	1.40W/m ² K	1.20W/m ² K
Doors	1.40W/m ² K	1.80W/m ² K
Air Permeability	15.00m ³ /m ² /hr	5.00m ³ /m ² /hr
Thermal Bridging	Calculated	Calculated
Ventilation	System 1	System 1
Lighting	100% low energy lamps	100% low energy lamps
Space Heating	Mains Gas Combi Boiler	Mains Gas Combi Boiler
Controls	At least two heating zones, each with their own time and temperature control	At least two heating zones, each with their own time and temperature control
DHW	Via main heating	Via main heating
LZC Technology	none	none

Table 3c: 'Be Lean' specification



The improved 'Be Lean' carbon dioxide emissions and energy consumption figures as taken from the SAP models for the above specification are shown in Table 3d & 3e below:

	Energy Consumption (kWh per annum)	Carbon Dioxide Emissions for domestic buildings (Tonnes CO ₂ per annum)	
	Regulated	Regulated	Unregulated
Baseline: Part L 2013 of the Building Regulations Compliant Development	32,670	7	3
After energy demand reduction	29,215	6	3

Table 3d: Total reduction in energy use and carbon emissions – SAP10

	Regulated domestic carbon dioxide savings	
	(Tonnes CO ₂ per annum)	(%)
Savings from energy demand reduction	1	10%

Table 3e: Total savings in regulated carbon emissions – SAP10

3.4 Be Clean - Communal Heating and CHP

Reading Local Plan Policy CC3 requires that connection to existing decentralised energy networks be considered. Developments of 20 or more dwellings should consider the inclusion of decentralised energy provision within the site. Developments of 10 or more dwellings are expected to link into any existing decentralised energy network.

As the development is only for 6 dwellings, there is no requirement triggered to incorporate any form of decentralised energy provision within the site (in the form of a communal heating system).

Similarly, there is no information available as of the date of this report of any existing decentralised energy schemes close by the proposed development site. As such, there is no current expectation that this development will be able to connect into an existing network in the near future.

It is not, therefore, considered that the incorporation of, or connection to, a district heating system is a viable option for this development.

As such, Tables 3f & 3g, below, shows the performance following the 'Be Clean' stage of the energy hierarchy. Full details (SAP worksheets) can be found in Appendix A.



	Energy Consumption (kWh per annum)	Carbon Dioxide Emissions for domestic buildings (Tonnes CO ₂ per annum)	
	Regulated	Regulated	Unregulated
Baseline: Part L 2013 of the Building Regulations Compliant Development	32,670	7	3
After energy demand reduction	29,215	6	3
After heat network / CHP	29,215	6	3

Table 3f: Total reduction in energy use and carbon emissions – SAP10

	Regulated domestic carbon dioxide savings	
	(Tonnes CO ₂ per annum)	(%)
Savings from energy demand reduction	1	10%
Savings from heat network / CHP	0	0%

Table 3g: Total savings in regulated carbon emissions – SAP10

3.5 'Be Green' – CO₂ reduction through the use of renewable or low carbon technology

Reading Local Plan Policy H5 requires minor development, such as that proposed at 233 London Road, to achieve a minimum on site reduction in carbon dioxide emissions of 19%.

This section will examine the available renewable energy generation technologies and determine which is most appropriate for the proposed development at 233 London Road.

Available Renewable Generation Technologies

Energy resources accepted as renewable or low carbon technologies are defined by the Department of Energy and Climate Change Low Carbon Buildings Program as:

- Solar photovoltaics
- Wind turbines
- Small hydro
- Solar thermal hot water
- Ground source heat pumps



- Air source heat pumps
- Bio-energy
- Renewable CHP
- Micro CHP (Combined heat and power)

Solar Photovoltaics

Solar panel electricity systems, also known as solar photovoltaics (PV), capture the sun's energy using photovoltaic cells. These cells do not need direct sunlight to work – they can still generate some electricity on a cloudy day. The cells convert the sunlight into electricity, which can be used to run household appliances and lighting. When excess power is generated this can be sold back to the grid or stored onsite.



As there is limited roofspace on the proposed development relative to the number of units being provided there will not be enough space for this technology to generate sufficient energy to offset the required CO₂. As such this technology is not considered to be suitable for this development.

Wind Turbines

Wind turbines harness the power of the wind and use it to generate electricity. Forty percent of all the wind energy in Europe blows over the UK, making it an ideal country for domestic turbines. Urban sites such as the location of this development are generally unsuitable for wind turbine installations due to the interrupted turbulent wind flows caused by surrounding buildings and large obstacles. There are also possible issues with noise and 'flicker' for the neighbouring buildings.



The urban nature of the site and lack of space mean that a wind turbine cannot be recommended as a viable option for this development. There are also general issues surrounding the use of building mounted turbines with the potential for excessive noise and vibration within the building and the effect of flicker on surrounding buildings and amenity spaces.

Table 3h: Average wind speeds for the site

45m above ground level	6.4m/s
25m above ground level	5.8m/s
10m above ground level	5.2m/s

Small Hydro Generation

Hydroelectricity generation uses running water to generate electricity, whether it is a small stream or a larger river. All streams and rivers flow downhill. Before the water flows down the hill, it has potential energy because of its height. Hydro power systems convert this potential energy into kinetic energy in a turbine, which drives a generator to produce electricity. Small, or 'micro' hydro generation requires a reliable source of flowing water with a reasonably constant flow velocity. Systems of this nature are normally installed in locations with a natural moving water source such as a river, stream or spring where part of the flow can be diverted through a generator.



There is no such source of flowing water in this case and small hydro generation is not an option for this development.

Solar Water heating



Solar water heating systems use free heat from the sun to warm domestic hot water. Solar hot water heating can generate a large proportion of a buildings annual DHW requirement. The displaced fuel would be mains gas meaning that the CO₂ savings of this type of system would be relatively low due to the low carbon intensity of the displaced fuel.

However, this technology would need sufficient space on the roof for the panels – at least one panel would be required for each apartment. As with photovoltaic panels there is not sufficient space available due to the roof garden, so this technology is not considered suitable for this development.

Heat Pumps

Heat pumps use similar technology as refrigerators but reversed. A refrigerant liquid is used as a medium to extract heat from a source and convert it into useful heat energy. The heat source used can be generally one of three types; the ground, the air or a body of water. Both ground and water sourced heat pumps use a long circuitous pipe through which a refrigerant is pumped. In ground sourced heat pumps this can be either a coiled pipe or 'slinky' that is buried in a series of

horizontal trenches or a loop inside a vertical bore hole to depths that can be up to 200m or deeper. Water sourced heat pumps generally use a similar system to the 'slinky' used for ground sourced systems but either floated on or submerged in a body of water (either a large pool or running water source). Air source heat pumps have a refrigerant coil mounted outside the building through which is passed air so that heat can be extracted. All three types of heat pump generally use the collected heat from the source to heat water. The heated water can then be used for space heating and DHW. Heat pumps require an input of energy to drive pumps, this is usually electricity and so their renewable generation is the difference between the input and output energy. Most have very good efficiencies; energy produced by heat pumps is typically in the region of 2.5 times that which is required to run them, giving efficiencies of 250% and above.



Ground source heat pumps are not going to be suitable for this development due to the limited footprint area. As such air source heat pumps have been specified to provide both space and DHW heating for the flats.

Bio Energy

The Low Carbon Buildings Program (LCBP) defines biomass as follows:

"Biomass is often called 'bioenergy' or 'biofuels'. These biofuels are produced from organic materials, either directly from plants or indirectly from industrial, commercial, domestic or agricultural products. Biofuels fall into two main categories:

- *Woody biomass includes forest products, untreated wood products, energy crops, short rotation coppice (SRC), e.g. willow.*
- *Non-woody biomass includes animal waste, industrial and biodegradable municipal products from food processing and high energy crops, e.g. rape, sugar cane, maize."*



For small-scale domestic [and small scale commercial] applications of biomass the fuel usually takes the form of wood pellets, wood chips and logs. The LCBP goes on to state:

"There are two main ways of using biomass to heat a domestic property:

- *Stand-alone stoves providing space heating for a single room. These can be fuelled by logs or pellets but only pellets are suitable for automatic feed. Generally they are 5-11 kW in output, and some models can be fitted with a back boiler to provide water heating.*
- *Boilers connected to central heating and hot water systems. These are suitable for pellets, logs or chips, and are generally larger than 15 kW"*

(<http://www.lowcarbonbuildings.org.uk/micro/biomass>)

This technology is dismissed as the space requirements needed for the boiler and pellet store make this impractical along with complying with clean air zone requirements.

'Be Green' Modelled Performance

The proposal is, as above, to use ASHPs for the space and DHW heating. The final specification for the scheme is, therefore, shown below in table 3i, below.

Element	Conversion Proposed Specification	New-Build Proposed Specification
External Walls	0.20W/m ² K	0.15-0.18W/m ² K
Walls to Corridors/ Stairwells	0.20W/m ² K	0.20W/m ² K
Party Walls	0.00W/m ² K	0.00W/m ² K
Roofs	0.10-0.11W/m ² K	0.10-0.14W/m ² K
Ground Floor	0.16W/m ² K	0.10W/m ² K
Exposed Floors	0.12W/m ² K	-
Windows	1.40W/m ² K	1.20W/m ² K
Doors	1.40W/m ² K	1.80W/m ² K
Air Permeability	15.00m ³ /m ² /hr	5.00m ³ /m ² /hr
Thermal Bridging	Calculated	Calculated
Ventilation	System 1	System 1
Lighting	100% low energy lamps	100% low energy lamps
Space Heating	ASHP	ASHP
Controls	At least two heating zones, each with their own time and temperature control	At least two heating zones, each with their own time and temperature control
DHW	Via main heating	Via main heating
LZC Technology	none	none

Table 3i: 'Be Green' specification

The final 'Be Green' carbon dioxide emissions and energy consumption figures as taken from the SAP models for the above specification are shown in Tables 3j & 3k below. Full details (SAP worksheets) can be found in Appendix B.

	Energy Consumption (kWh per annum)	Carbon Dioxide Emissions for domestic buildings (Tonnes CO ₂ per annum)	
	Regulated	Regulated	Unregulated
Baseline: Part L 2013 of the Building Regulations Compliant Development	32,670	7	3
After energy demand reduction	29,215	6	3
After heat network / CHP	29,215	6	3
After renewable energy	14,391	3	3

Table 3j: Total reduction in energy use and carbon emissions – SAP10

	Regulated domestic carbon dioxide savings	
	(Tonnes CO ₂ per annum)	(%)
Savings from energy demand reduction	1	10%
Savings from heat network / CHP	0	0%
Savings from renewable energy	3	41%
Cumulative on site savings	4	51%

Table 3k: Total savings in regulated carbon emissions – SAP10



Section 4: Water Consumption

Water is a precious commodity even in the UK and with ever increasing demand for clean drinking water measures need to be taken to safeguard future supplies.

Approximately 50% of the water consumed in domestic dwellings is not used for consumption, (the percentage is even higher in many commercial buildings) it is for washing and flushing of toilets etc. Measures to reduce the amount of potable water used for these activities reduce the demand for potable water and make better use of this limited resource.

In line with the requirement of London Plan 2021 policy SI5 water use in the residential units will be reduced to at least 110l/person/day (which includes 5l/person/day for external water use). This reduction in water use will be achieved through specification of water use fittings that do not exceed the following specification;

Taps (other than kitchen taps)		4.00(litres/min)
Kitchen Taps		8.00(litres/min)
Showers (over baths)		9.00(litres/min)
Baths (with shower over)		170(litres to overflow)
WCs (Flush Volume)	Full Flush:	4.00(litres)
	Part Flush:	2.60(litres)
Washing Machine		8.17(litres/kg dry load)
Dishwasher		1.25(litres/place setting)

For full details of the consumption of this specification please see Appendix C.



Appendix A

SAP Calculations for 'Be Lean, Be Clean'



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building solutions
Part of the **FOCUS** consultancy group

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	0007-Conversion-Flat-1			Issued on Date	12/04/2022
Assessment Reference	Be Lean	Prop Type Ref	Conversion Flat 1		
Property	Conversion Flat 1, 233, London Road, East Reading, Reading, Berkshire, RG1 3NY				
SAP Rating	77 C	DER	32.34	TER	23.56
Environmental	79 C	% DER<TER	-37.29		
CO ₂ Emissions (t/year)	1.36	DFEE	95.99	TFEE	68.70
General Requirements Compliance	Fail	% DFEE<TFEE	-39.72		
Assessor Details	Mr. Andrew Taylor, Andrew Taylor, Tel: 01636 653 055, andy@mesbuildingsolutions.co.uk			Assessor ID	P741-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

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

DWELLING AS DESIGNED

Ground-floor flat, total floor area 52 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) 23.56 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 32.34 kgCO₂/m²Fail
Excess emissions =8.78 kgCO₂/m² (37.3%)

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)68.7 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)96.0 kWh/m²/yrFail
Excess energy =27.3 kWh/m²/yr (39.7%)

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.20 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.16 (max. 0.25)	0.16 (max. 0.70)	OK
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	OK
Openings	1.46 (max. 2.00)	1.80 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using default y-value of 0.15

3 Air permeability

Air permeability at 50 pascals: 15.00 (assumed) OK

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from manufacturer
tbc tbc
Combi boiler
Efficiency: 89%
Minimum: 88% OK

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Time and temperature zone control 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 North: 7.65 m², No overhang
Windows facing East: 3.83 m², No overhang
Air change rate: 8.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.11 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	27.1100 (1b)	x 2.8000 (2b)	= 75.9080 (1b) - (3b)
First floor	25.0700 (1c)	x 2.8600 (2c)	= 71.7002 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.1800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 147.6082 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) = 0.2032 (8)
Pressure test					No
Measured/design AP50					15.0000
Infiltration rate					0.9532 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.8103 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	1.0331	1.0128	0.9926	0.8913	0.8710	0.7697	0.7697	0.7495	0.8103	0.8710	0.9115	0.9520 (22b)
Effective ac	1.0331	1.0128	0.9926	0.8972	0.8793	0.7963	0.7963	0.7809	0.8283	0.8793	0.9154	0.9532 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.40)			11.4800	1.3258	15.2197		(27)
Door			1.8900	1.8000	3.4020		(26)
REFURB - Ground Floor			27.1100	0.1600	4.3376	110.0000	2982.1000 (28a)
REFURB - External Wall	63.7500	13.3700	50.3800	0.2000	10.0760	190.0000	9572.2000 (29a)
REFURB - Wall onto Commercial	16.7200		16.7200	0.1000	1.6720	190.0000	3176.8000 (29a)
REFURB - Wall onto Stairwell	9.8700		9.8700	0.2000	1.9740	18.0000	177.6600 (29a)
REFURB - Plane Roof	25.0700		25.0700	0.1100	2.7577	9.0000	225.6300 (30)
Total net area of external elements Aum(A, m ²)			142.5200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.4390		(33)
Party Wall 1			30.8400	0.0000	0.0000	45.0000	1387.8000 (32)
Party Ceilings 1			2.0400			30.0000	61.2000 (32b)
GF Stud			16.8000			9.0000	151.2000 (32c)
FF Stud			51.0200			9.0000	459.1800 (32c)
Internal Floor			25.0700			18.0000	451.2600 (32d)
Internal Ceiling 1			25.0700			18.0000	451.2600 (32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		19096.2900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							365.9695 (35)
Thermal bridges (Default value 0.150 * total exposed area)							21.3780 (36)
Total fabric heat loss						(33) + (36) =	60.8170 (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	50.3218	49.3351	48.3497	43.7028	42.8333	38.7860	38.7860	38.0365	40.3449	42.8333	44.5922	46.4310 (38)
Heat transfer coeff	111.1388	110.1521	109.1667	104.5198	103.6503	99.6030	99.6030	98.8534	101.1619	103.6503	105.4092	107.2480 (39)
Average = Sum(39)m / 12 =												104.5130 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	2.1299	2.1110	2.0921	2.0031	1.9864	1.9088	1.9088	1.8945	1.9387	1.9864	2.0201	2.0553 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7544 (42)
Average daily hot water use (litres/day)												75.8665 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy conte	83.4532	80.4185	77.3839	74.3492	71.3146	68.2799	68.2799	71.3146	74.3492	77.3839	80.4185	83.4532 (44)
Energy content (annual)	123.7587	108.2401	111.6941	97.3776	93.4362	80.6283	74.7140	85.7354	86.7593	101.1096	110.3691	119.8537 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum (45)m =		1193.6762 (45)
Water storage loss:	18.5638	16.2360	16.7541	14.6066	14.0154	12.0942	11.2071	12.8603	13.0139	15.1664	16.5554	17.9781 (46)
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	42.5268	37.0146	39.4340	36.6654	36.3411	33.6723	34.7947	36.3411	36.6654	39.4340	39.6585	42.5268 (61)
Total heat required for water heating calculated for each month	166.2855	145.2547	151.1281	134.0430	129.7773	114.3006	109.5087	122.0765	123.4247	140.5436	150.0275	162.3805 (62)
Solar input	0.0000	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	166.2855	145.2547	151.1281	134.0430	129.7773	114.3006	109.5087	122.0765	123.4247	140.5436	150.0275	162.3805 (64)
Heat gains from water heating, kWh/month	51.7815	45.2435	46.9968	41.5444	40.1528	35.2270	33.5411	37.5923	38.0138	43.4775	46.6123	50.4831 (65)
										Total per year (kWh/year) = Sum (64)m =		1648.7508 (64)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	87.7191	87.7191	87.7191	87.7191	87.7191	87.7191	87.7191	87.7191	87.7191	87.7191	87.7191	87.7191 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	13.6352	12.1106	9.8490	7.4564	5.5737	4.7056	5.0845	6.6091	8.8707	11.2634	13.1460	14.0141 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	152.8928	154.4793	150.4813	141.9699	131.2258	121.1279	114.3818	112.7953	116.7933	125.3047	136.0488	146.1467 (68)
Pumps, fans	31.7719	31.7719	31.7719	31.7719	31.7719	31.7719	31.7719	31.7719	31.7719	31.7719	31.7719	31.7719 (69)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (Table 5)	-70.1752	-70.1752	-70.1752	-70.1752	-70.1752	-70.1752	-70.1752	-70.1752	-70.1752	-70.1752	-70.1752	-70.1752 (71)
Total internal gains	69.5988	67.3266	63.1677	57.7006	53.9688	48.9264	45.0821	50.5273	52.7970	58.4374	64.7394	67.8536 (72)
	288.4424	286.2323	275.8137	259.4425	243.0840	227.0755	216.8642	222.2473	230.7767	247.3212	266.2499	280.3302 (73)

6. Solar gains

[Jan]				Area	Solar flux	g		FF	Access		Gains	
				m2	Table 6a	Specific data		Specific data	factor		W	
					W/m2	or Table 6b		or Table 6c	Table 6d			
North				7.6500	10.6334	0.6300		0.7000	0.7700		24.8602 (74)	
East				3.8300	19.6403	0.6300		0.7000	0.7700		22.9889 (76)	
Solar gains	47.8491	92.4803	154.7907	237.6862	307.0556	322.5101	303.5995	249.3322	183.1993	109.9155	59.3327	39.6297 (83)
Total gains	336.2915	378.7126	430.6045	497.1287	550.1396	549.5856	520.4637	471.5796	413.9760	357.2367	325.5826	319.9598 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	47.7288	48.1564	48.5910	50.7514	51.1771	53.2567	53.2567	53.6605	52.4360	51.1771	50.3232	49.4604
util living area	4.1819	4.2104	4.2394	4.3834	4.4118	4.5504	4.5504	4.5774	4.4957	4.4118	4.3549	4.2974
MIT	0.9994	0.9988	0.9971	0.9898	0.9620	0.8749	0.7431	0.8055	0.9588	0.9949	0.9989	0.9995 (86)
Th 2	19.2296	19.3713	19.6503	20.0864	20.4849	20.8127	20.9384	20.9103	20.6412	20.1439	19.6548	19.2585 (87)
util rest of house	19.2481	19.2604	19.2726	19.3313	19.3424	19.3948	19.3948	19.4046	19.3745	19.3424	19.3200	19.2967 (88)
MIT 2	0.9990	0.9981	0.9952	0.9823	0.9290	0.7580	0.5200	0.5994	0.9048	0.9900	0.9981	0.9992 (89)
Living area fraction	16.9870	17.2020	17.6176	18.2888	18.8546	19.2879	19.3812	19.3795	19.0970	18.3836	17.6553	17.0603 (90)
MIT	18.0013	18.1831	18.5370	19.1018	19.5920	19.9775	20.0855	20.0718	19.7954	19.1797	18.5596	18.0545 (92)
Temperature adjustment												-0.1500
adjusted MIT	17.8513	18.0331	18.3870	18.9518	19.4420	19.8275	19.9355	19.9218	19.6454	19.0297	18.4096	17.9045 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9985	0.9974	0.9938	0.9798	0.9317	0.7970	0.6057	0.6792	0.9177	0.9885	0.9974	0.9989 (94)
Ext temp.	335.7970	377.7213	427.9174	487.0957	512.5573	438.0221	315.2395	320.3020	379.8871	353.1212	324.7511	319.6025 (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	1506.0736	1446.6421	1297.6596	1050.6130	802.4599	520.6792	332.2275	348.1439	560.9822	873.7459	1192.1373	1469.7788 (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	870.6858	718.3148	647.0882	405.7325	215.6876	0.0000	0.0000	0.0000	0.0000	387.3448	624.5181	855.7312 (98)
Space heating per m2												4725.1029 (98)
										(98) / (4) =		90.5539 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													89.0000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													5309.1044 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	870.6858	718.3148	647.0882	405.7325	215.6876	0.0000	0.0000	0.0000	0.0000	387.3448	624.5181	855.7312	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	978.2986	807.0953	727.0654	455.8792	242.3456	0.0000	0.0000	0.0000	0.0000	435.2188	701.7057	961.4958	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	166.2855	145.2547	151.1281	134.0430	129.7773	114.3006	109.5087	122.0765	123.4247	140.5436	150.0275	162.3805	(64)
Efficiency of water heater (217)m	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	(216)
Fuel for water heating, kWh/month	186.8377	163.2075	169.8069	150.6101	145.8172	128.4276	123.0434	137.1646	138.6794	157.9142	168.5703	182.4500	(219)
Water heating fuel used												1852.5290	(219)
Annual totals kWh/year													
Space heating fuel - main system												5309.1044	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
Total electricity for the above, kWh/year												30.0000	(231)
Electricity for lighting (calculated in Appendix L)												240.8015	(232)
Total delivered energy for all uses												7432.4349	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	5309.1044	0.2160	1146.7665 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1852.5290	0.2160	400.1463 (264)
Space and water heating			1546.9128 (265)
Pumps and fans	30.0000	0.5190	15.5700 (267)
Energy for lighting	240.8015	0.5190	124.9760 (268)
Total CO2, kg/year			1687.4588 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			32.3400 (273)

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

DER			32.3400 ZC1
Total Floor Area		TFA	52.1800
Assumed number of occupants		N	1.7544
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			17.3632 ZC2
CO2 emissions from cooking, equation (L16)			3.0875 ZC3
Total CO2 emissions			52.7907 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			52.7907 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	27.1100 (1b)	x 2.8000 (2b)	= 75.9080 (1b) - (3b)
First floor	25.0700 (1c)	x 2.8600 (2c)	= 71.7002 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.1800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 147.6082 (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) = 0.1355 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3855 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3277 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4178	0.4096	0.4014	0.3604	0.3522	0.3113	0.3113	0.3031	0.3277	0.3522	0.3686	0.3850 (22b)
Effective ac	0.5873	0.5839	0.5806	0.5650	0.5620	0.5484	0.5484	0.5459	0.5537	0.5620	0.5679	0.5741 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			11.1500	1.3258	14.7822		(27)
REFURB - Ground Floor			27.1100	0.1300	3.5243		(28a)
REFURB - External Wall	63.7500	13.0400	50.7100	0.1800	9.1278		(29a)
REFURB - Wall onto Commercial	16.7200		16.7200	0.1800	3.0096		(29a)
REFURB - Wall onto Stairwell	9.8700		9.8700	0.1800	1.7766		(29a)
REFURB - Plane Roof	25.0700		25.0700	0.1300	3.2591		(30)
Total net area of external elements Aum(A, m ²)			142.5200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		37.3696		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (User defined value 0.050 * total exposed area)							7.1260 (36)
Total fabric heat loss						(33) + (36) =	44.4956 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	28.6063	28.4412	28.2794	27.5195	27.3773	26.7154	26.7154	26.5928	26.9703	27.3773	27.6649	27.9656 (38)
Heat transfer coeff	73.1019	72.9368	72.7750	72.0151	71.8729	71.2110	71.2110	71.0884	71.4659	71.8729	72.1605	72.4612 (39)
Average = Sum(39)m / 12 =												72.0144 (39)
HLP	1.4010	1.3978	1.3947	1.3801	1.3774	1.3647	1.3647	1.3624	1.3696	1.3774	1.3829	1.3887 (40)
HLP (average)												1.3801 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7544 (42)
Average daily hot water use (litres/day)												75.8665 (43)
Daily hot water use	83.4532	80.4185	77.3839	74.3492	71.3146	68.2799	68.2799	71.3146	74.3492	77.3839	80.4185	83.4532 (44)
Energy conte	123.7587	108.2401	111.6941	97.3776	93.4362	80.6283	74.7140	85.7354	86.7593	101.1096	110.3691	119.8537 (45)
Energy content (annual)										Total = Sum(45)m =		1193.6762 (45)
Distribution loss (46)m = 0.15 x (45)m												
18.5638	16.2360	16.7541	14.6066	14.0154	12.0942	11.2071	12.8603	13.0139	15.1664	16.5554	17.9781	(46)
Water storage loss:												
Total storage loss												

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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 (56)
Combi loss	42.5268	37.0146	39.4340	36.6654	36.3411	33.6723	34.7947	36.3411	36.6654	39.4340	39.6585	42.5268 (57)
Total heat required for water heating calculated for each month	166.2855	145.2547	151.1281	134.0430	129.7773	114.3006	109.5087	122.0765	123.4247	140.5436	150.0275	162.3805 (62)
Solar input	0.0000	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	166.2855	145.2547	151.1281	134.0430	129.7773	114.3006	109.5087	122.0765	123.4247	140.5436	150.0275	162.3805 (64)
Heat gains from water heating, kWh/month	51.7815	45.2435	46.9968	41.5444	40.1528	35.2270	33.5411	37.5923	38.0138	43.4775	46.6123	50.4831 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	87.7191	87.7191	87.7191	87.7191	87.7191	87.7191	87.7191	87.7191	87.7191	87.7191	87.7191	87.7191	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.6528	12.1263	9.8618	7.4660	5.5809	4.7117	5.0911	6.6176	8.8821	11.2779	13.1630	14.0323	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	152.8928	154.4793	150.4813	141.9699	131.2258	121.1279	114.3818	112.7953	116.7933	125.3047	136.0488	146.1467	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.7719	31.7719	31.7719	31.7719	31.7719	31.7719	31.7719	31.7719	31.7719	31.7719	31.7719	31.7719	(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)	-70.1752	-70.1752	-70.1752	-70.1752	-70.1752	-70.1752	-70.1752	-70.1752	-70.1752	-70.1752	-70.1752	-70.1752	(71)
Water heating gains (Table 5)	69.5988	67.3266	63.1677	57.7006	53.9688	48.9264	45.0821	50.5273	52.7970	58.4374	64.7394	67.8536	(72)
Total internal gains	288.4601	286.2480	275.8265	259.4522	243.0913	227.0816	216.8707	222.2559	230.7882	247.3358	266.2669	280.3483	(73)

6. Solar gains

[Jan]	Area m2				Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
North	7.4300				10.6334	0.6300		0.7000		0.7700		24.1453
East	3.7200				19.6403	0.6300		0.7000		0.7700		22.3286 (76)

Solar gains	46.4739	89.8224	150.3420	230.8548	298.2302	313.2404	294.8734	242.1661	177.9341	106.7565	57.6275	38.4907 (83)
Total gains	334.9340	376.0704	426.1685	490.3070	541.3215	540.3220	511.7442	464.4219	408.7222	354.0923	323.8944	318.8390 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	49.5693	49.6815	49.7919	50.3174	50.4169	50.8856	50.8856	50.9733	50.7040	50.4169	50.2160	50.0076	
alpha	4.3046	4.3121	4.3195	4.3545	4.3611	4.3924	4.3924	4.3982	4.3803	4.3611	4.3477	4.3338	
util living area	0.9972	0.9950	0.9880	0.9625	0.8881	0.7394	0.5827	0.6517	0.8817	0.9794	0.9950	0.9978	(86)
MIT	19.4737	19.6221	19.9073	20.3100	20.6756	20.9026	20.9737	20.9578	20.7703	20.3075	19.8246	19.4490	(87)
Th 2	19.7626	19.7650	19.7674	19.7786	19.7807	19.7905	19.7905	19.7923	19.7867	19.7807	19.7765	19.7720	(88)
util rest of house	0.9962	0.9932	0.9835	0.9471	0.8409	0.6373	0.4369	0.5049	0.8118	0.9682	0.9929	0.9970	(89)
MIT 2	17.7543	17.9724	18.3884	18.9713	19.4628	19.7263	19.7813	19.7753	19.5976	18.9782	18.2765	17.7245	(90)
Living area fraction	18.5319	18.7186	19.0754	19.5768	20.0114	20.2583	20.3206	20.3101	20.1280	19.5794	18.9767	18.5044	(91)
MIT	18.5319	18.7186	19.0754	19.5768	20.0114	20.2583	20.3206	20.3101	20.1280	19.5794	18.9767	18.5044	(92)
Temperature adjustment	18.5319	18.7186	19.0754	19.5768	20.0114	20.2583	20.3206	20.3101	20.1280	19.5794	18.9767	18.5044	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	333.2025	372.6930	417.6340	462.7889	460.7741	367.3884	257.6487	265.5128	341.2389	341.9465	320.9477	317.5030	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1040.3807	1007.8815	915.1741	768.8890	597.3610	402.9347	264.9495	277.9659	430.7957	645.3782	857.0267	1036.5172	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	526.1406	426.8467	370.1698	220.3921	101.6206	0.0000	0.0000	0.0000	0.0000	225.7532	385.9768	534.9465	(98)
Space heating												2791.8463	(98)
Space heating per m2												53.5041	(99)

8c. Space cooling requirement

Not applicable

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Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2989.1288 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	526.1406	426.8467	370.1698	220.3921	101.6206	0.0000	0.0000	0.0000	0.0000	225.7532	385.9768	534.9465	(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)	563.3197	457.0093	396.3275	235.9659	108.8015	0.0000	0.0000	0.0000	0.0000	241.7057	413.2514	572.7479	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	166.2855	145.2547	151.1281	134.0430	129.7773	114.3006	109.5087	122.0765	123.4247	140.5436	150.0275	162.3905	(64)
Efficiency of water heater (217)m	87.7495	87.6024	87.2196	86.2951	84.4432	80.3000	80.3000	80.3000	80.3000	86.2382	87.3257	87.8276	(217)
Fuel for water heating, kWh/month	189.5003	165.8112	173.2731	155.3309	153.6858	142.3420	136.3744	152.0255	153.7045	162.9715	171.8023	184.8855	(219)
Water heating fuel used												1941.7071	(219)
Annual totals kWh/year													
Space heating fuel - main system												2989.1288	(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)												241.1132	(232)
Total delivered energy for all uses												5246.9491	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2989.1288	0.2160	645.6518 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1941.7071	0.2160	419.4087 (264)
Space and water heating			1065.0605 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	241.1132	0.5190	125.1377 (268)
Total CO2, kg/m2/year			1229.1233 (272)
Emissions per m2 for space and water heating			20.4113 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3982 (272b)
Emissions per m2 for pumps and fans			0.7460 (272c)
Target Carbon Dioxide Emission Rate (TER) = (20.4113 * 1.00) + 2.3982 + 0.7460, rounded to 2 d.p.			23.5600 (273)

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Calculation Type: New Build (As Designed)



Property Reference	0007-Conversion-Flat-2				Issued on Date	12/04/2022
Assessment Reference	Be Lean	Prop Type Ref	Conversion Flat 2			
Property	Conversion Flat 2, 233, London Road, East Reading, Reading, Berkshire, RG1 3NY					
SAP Rating		79 C	DER	30.96	TER	24.45
Environmental		83 B	% DER<TER	-26.63		
CO ₂ Emissions (t/year)		0.87	DFEE	83.89	TFEE	59.64
General Requirements Compliance		Fail	% DFEE<TFEE	-40.66		
Assessor Details	Mr. Andrew Taylor, Andrew Taylor, Tel: 01636 653 055, andy@mesbuildingsolutions.co.uk				Assessor ID	P741-0001
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 35 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) 24.45 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 30.96 kgCO₂/m²Fail
Excess emissions =6.51 kgCO₂/m² (26.6%)

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)59.6 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)83.9 kWh/m²/yrFail
Excess energy =24.3 kWh/m²/yr (40.8%)

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.20 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.05 (max. 0.25)	0.05 (max. 0.70)	OK
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using default y-value of 0.15

3 Air permeability

Air permeability at 50 pascals: 15.00 (assumed) OK

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from manufacturer
tbc tbc
Combi boiler
Efficiency: 89%
Minimum: 88% OK

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Time and temperature zone control 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: 4.19 m², No overhang
Windows facing South: 3.83 m², No overhang
Air change rate: 8.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.10 W/m²K
Exposed floor U-value 0.10 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	34.7300 (1b)	x 2.6000 (2b)	= 90.2980 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	34.7300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 90.2980 (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) = 0.2215 (8)
Pressure test					No
Measured/design AP50					15.0000
Infiltration rate					0.9715 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.8258 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	1.0529	1.0322	1.0116	0.9083	0.8877	0.7845	0.7845	0.7638	0.8258	0.8877	0.9290	0.9703 (22b)
Effective ac	1.0529	1.0322	1.0116	0.9125	0.8940	0.8077	0.8077	0.7917	0.8409	0.8940	0.9315	0.9707 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.40)			8.0200	1.3258	10.6326		(27)
Door			1.8900	1.4000	2.6460		(26)
REFURB -Floor to Commerical			34.7300	0.0500	1.7365	110.0000	3820.3000 (28b)
REFURB - External Wall	35.4600	9.9100	25.5500	0.2000	5.1100	190.0000	4854.5000 (29a)
REFURB - Wall onto Stairwell	22.7000		22.7000	0.2000	4.5400	18.0000	408.6000 (29a)
REFURB - Flat Roof onto Stair	3.2900		3.2900	0.0970	0.3191	9.0000	29.6100 (30)
Total net area of external elements Aum(A, m ²)			96.1800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	24.9842		(33)
Party Wall 1			12.7700	0.0000	0.0000	45.0000	574.6500 (32)
Party Floor 1			1.5300			30.0000	45.9000 (32d)
Party Ceilings 1			32.9800			30.0000	989.4000 (32b)
Stud			48.9000			9.0000	440.1000 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 11163.0600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							321.4241 (35)
Thermal bridges (Default value 0.150 * total exposed area)							14.4270 (36)
Total fabric heat loss							(33) + (36) = 39.4112 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	31.3732	30.7581	30.1429	27.1923	26.6398	24.0682	24.0682	23.5920	25.0587	26.6398	27.7574	28.9257 (38)
Heat transfer coeff	70.7844	70.1692	69.5541	66.6034	66.0510	63.4794	63.4794	63.0031	64.4699	66.0510	67.1686	68.3369 (39)
Average = Sum(39)m / 12 =												66.5959 (39)
HLP	2.0381	2.0204	2.0027	1.9177	1.9018	1.8278	1.8278	1.8141	1.8563	1.9018	1.9340	1.9677 (40)
HLP (average)												1.9175 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.2744 (42)
Average daily hot water use (litres/day)												64.4668 (43)
Daily hot water use	70.9135	68.3349	65.7562	63.1775	60.5988	58.0202	58.0202	60.5988	63.1775	65.7562	68.3349	70.9135 (44)
Energy conte	105.1627	91.9760	94.9110	82.7457	79.3965	68.5131	63.4875	72.8528	73.7229	85.9169	93.7850	101.8445 (45)
Energy content (annual)												Total = Sum(45)m = 1014.3145 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	15.7744	13.7964	14.2366	12.4119	11.9095	10.2770	9.5231	10.9279	11.0584	12.8875	14.0678	15.2767 (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	36.1368	31.4528	33.5086	31.1560	30.8805	28.6127	29.5664	30.8805	31.1560	33.5086	33.6994	36.1368 (61)
Total heat required for water heating calculated for each month	141.2995	123.4287	128.4196	113.9017	110.2770	97.1258	93.0539	103.7333	104.8789	119.4255	127.4844	137.9812 (62)
Solar input	0.0000	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	141.2995	123.4287	128.4196	113.9017	110.2770	97.1258	93.0539	103.7333	104.8789	119.4255	127.4844	137.9812 (64)
Heat gains from water heating, kWh/month	44.0008	38.4452	39.9351	35.3019	34.1194	29.9338	28.5012	31.9437	32.3019	36.9445	39.6084	42.8975 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	63.7197	63.7197	63.7197	63.7197	63.7197	63.7197	63.7197	63.7197	63.7197	63.7197	63.7197	63.7197 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	9.6767	8.5948	6.9898	5.2917	3.9556	3.3395	3.6084	4.6904	6.2954	7.9935	9.3296	9.9457 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	108.5435	109.6698	106.8315	100.7890	93.1614	85.9926	81.2033	80.0770	82.9154	88.9579	96.5854	103.7543 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.3720	29.3720	29.3720	29.3720	29.3720	29.3720	29.3720	29.3720	29.3720	29.3720	29.3720	29.3720 (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)	-50.9757	-50.9757	-50.9757	-50.9757	-50.9757	-50.9757	-50.9757	-50.9757	-50.9757	-50.9757	-50.9757	-50.9757 (71)
Water heating gains (Table 5)	59.1408	57.2101	53.6762	49.0305	45.8595	41.5747	38.3081	42.9351	44.8637	49.6566	55.0116	57.6579 (72)
Total internal gains	222.4770	220.5906	212.6133	200.2271	188.0924	176.0227	168.2357	172.8183	179.1904	191.7239	206.0425	216.4737 (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					4.1900	19.6403	0.6300	0.7000	0.7700	25.1497 (76)		
South					3.8300	46.7521	0.6300	0.7000	0.7700	54.7232 (78)		
Solar gains	79.8729	138.8207	195.1856	247.1955	279.2736	277.6422	267.5642	244.0130	213.4893	155.0441	96.2244	67.9678 (83)
Total gains	302.3499	359.4113	407.7988	447.4226	467.3660	453.6649	435.7999	416.8313	392.6797	346.7679	302.2669	284.4415 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
Jan	43.8070	44.1910	44.5819	46.5569	46.9463	48.8482	48.8482	49.2174	48.0976	46.9463	46.1652	45.3759
alpha	3.9205	3.9461	3.9721	4.1038	4.1298	4.2565	4.2565	4.2812	4.2065	4.1298	4.0777	4.0251
util living area	0.9964	0.9925	0.9835	0.9582	0.8974	0.7626	0.6026	0.6429	0.8547	0.9697	0.9932	0.9973 (86)
MIT	19.2835	19.4901	19.8106	20.2531	20.6133	20.8792	20.9665	20.9562	20.7820	20.3041	19.7485	19.2997 (87)
Th 2	19.3080	19.3198	19.3315	19.3887	19.3996	19.4506	19.4506	19.4602	19.4308	19.3996	19.3777	19.3550 (88)
util rest of house	0.9948	0.9891	0.9753	0.9356	0.8375	0.6305	0.4094	0.4532	0.7506	0.9486	0.9894	0.9960 (89)
MIT 2	17.1343	17.4420	17.9128	18.5768	19.0591	19.3865	19.4432	19.4487	19.2878	18.6664	17.8566	17.1875 (90)
Living area fraction	18.3614	18.6114	18.9964	19.5339	19.9465	20.2388	20.3130	20.3094	20.1409	19.6015	18.9368	18.3936 (91)
MIT	18.2114	18.4614	18.8464	19.3839	19.7965	20.0888	20.1630	20.1594	19.9909	19.4515	18.7868	18.2436 (92)
Temperature adjustment												-0.1500
adjusted MIT												18.2436 (93)

8. Space heating requirement

Utilisation	0.9932	0.9865	0.9720	0.9355	0.8552	0.6908	0.5032	0.5452	0.7942	0.9495	0.9873	0.9947 (94)
Useful gains	300.2982	354.5752	396.3991	418.5757	399.6897	313.3948	219.2848	227.2769	311.8712	329.2492	298.4425	282.9401 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	984.7124	951.5943	858.7425	698.2660	534.7845	348.4227	226.1744	236.8563	379.7879	584.6501	784.9863	959.6932 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	509.2042	401.1968	343.9835	201.3770	100.5106	0.0000	0.0000	0.0000	0.0000	190.0183	350.3116	503.5043 (98)
Space heating												2600.1062 (98)
Space heating per m2												(98) / (4) = 74.8663 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													89.0000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2921.4677 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	509.2042	401.1968	343.9835	201.3770	100.5106	0.0000	0.0000	0.0000	0.0000	190.0183	350.3116	503.5043	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	572.1395	450.7829	386.4983	226.2663	112.9332	0.0000	0.0000	0.0000	0.0000	213.5037	393.6085	565.7352	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	141.2995	123.4287	128.4196	113.9017	110.2770	97.1258	93.0539	103.7333	104.8789	119.4255	127.4844	137.9812	(64)
Efficiency of water heater (217)m	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	(216)
Fuel for water heating, kWh/month	158.7635	138.6840	144.2917	127.9795	123.9067	109.1301	104.5549	116.5543	117.8415	134.1860	143.2409	155.0351	(219)
Water heating fuel used													1574.1681 (219)
Annual totals kWh/year													
Space heating fuel - main system													2921.4677 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
central heating pump													30.0000 (230c)
Total electricity for the above, kWh/year													30.0000 (231)
Electricity for lighting (calculated in Appendix L)													170.8941 (232)
Total delivered energy for all uses													4696.5298 (238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2921.4677	0.2160	631.0370 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1574.1681	0.2160	340.0203 (264)
Space and water heating			971.0573 (265)
Pumps and fans	30.0000	0.5190	15.5700 (267)
Energy for lighting	170.8941	0.5190	88.6940 (268)
Total CO2, kg/year			1075.3214 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			30.9600 (273)

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

DER		30.9600 ZC1
Total Floor Area	TFA	34.7300
Assumed number of occupants	N	1.2744
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		18.5202 ZC2
CO2 emissions from cooking, equation (L16)		4.3071 ZC3
Total CO2 emissions		53.7873 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		53.7873 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	34.7300 (1b)	x 2.6000 (2b)	= 90.2980 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	34.7300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 90.2980 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				2 * 10 =	20.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) = 0.2215 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4715 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.4008 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	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	0.5110	0.5010	0.4909	0.4408	0.4308	0.3807	0.3807	0.3707	0.4008	0.4308	0.4509	0.4709 (22b)
Effective ac	0.6305	0.6255	0.6205	0.5972	0.5928	0.5725	0.5725	0.5687	0.5803	0.5928	0.6016	0.6109 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			1.8900	1.0000	1.8900		(26)					
TER Opening Type (Uw = 1.40)			6.7900	1.3258	9.0019		(27)					
REFURB -Floor to Commercial			34.7300	0.1300	4.5149		(28b)					
REFURB - External Wall	35.4600	8.6800	26.7800	0.1800	4.8204		(29a)					
REFURB - Wall onto Stairwell	22.7000		22.7000	0.1800	4.0860		(29a)					
REFURB - Flat Roof onto Stair	3.2900		3.2900	0.1300	0.4277		(30)					
Total net area of external elements Aum(A, m2)			96.1800				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.7409		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (User defined value 0.050 * total exposed area)							4.8090 (36)					
Total fabric heat loss						(33) + (36) =	29.5499 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 18.7893	Feb 18.6382	Mar 18.4902	Apr 17.7947	May 17.6646	Jun 17.0589	Jul 17.0589	Aug 16.9467	Sep 17.2922	Oct 17.6646	Nov 17.9278	Dec 18.2030 (38)
Heat transfer coeff	48.3392	48.1881	48.0401	47.3446	47.2145	46.6087	46.6087	46.4966	46.8421	47.2145	47.4777	47.7529 (39)
Average = Sum(39)m / 12 =												47.3440 (39)
HLP	Jan 1.3919	Feb 1.3875	Mar 1.3832	Apr 1.3632	May 1.3595	Jun 1.3420	Jul 1.3420	Aug 1.3388	Sep 1.3487	Oct 1.3595	Nov 1.3671	Dec 1.3750 (40)
HLP (average)												1.3632 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.2744 (42)
Average daily hot water use (litres/day)												64.4668 (43)
Daily hot water use	70.9135	68.3349	65.7562	63.1775	60.5988	58.0202	58.0202	60.5988	63.1775	65.7562	68.3349	70.9135 (44)
Energy conte	105.1627	91.9760	94.9110	82.7457	79.3965	68.5131	63.4875	72.8528	73.7229	85.9169	93.7850	101.8445 (45)
Energy content (annual)										Total = Sum(45)m =		1014.3145 (45)
Distribution loss (46)m = 0.15 x (45)m	15.7744	13.7964	14.2366	12.4119	11.9095	10.2770	9.5231	10.9279	11.0584	12.8875	14.0678	15.2767 (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												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Combi 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 (57)
Total heat required for water heating calculated for each month	36.1368	31.4528	33.5086	31.1560	30.8805	28.6127	29.5664	30.8805	31.1560	33.5086	33.6994	36.1368 (61)
Solar input	141.2995	123.4287	128.4196	113.9017	110.2770	97.1258	93.0539	103.7333	104.8789	119.4255	127.4844	137.9812 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	141.2995	123.4287	128.4196	113.9017	110.2770	97.1258	93.0539	103.7333	104.8789	119.4255	127.4844	137.9812 (64)
	44.0008	38.4452	39.9351	35.3019	34.1194	29.9338	28.5012	31.9437	32.3019	36.9445	39.6084	42.8975 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	63.7197	63.7197	63.7197	63.7197	63.7197	63.7197	63.7197	63.7197	63.7197	63.7197	63.7197	63.7197	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	9.7696	8.6773	7.0568	5.3425	3.9936	3.3715	3.6431	4.7354	6.3558	8.0702	9.4191	10.0411	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	108.5435	109.6698	106.8315	100.7890	93.1614	85.9926	81.2033	80.0770	82.9154	88.9579	96.5854	103.7543	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.3720	29.3720	29.3720	29.3720	29.3720	29.3720	29.3720	29.3720	29.3720	29.3720	29.3720	29.3720	(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)	-50.9757	-50.9757	-50.9757	-50.9757	-50.9757	-50.9757	-50.9757	-50.9757	-50.9757	-50.9757	-50.9757	-50.9757	(71)
Water heating gains (Table 5)	59.1408	57.2101	53.6762	49.0305	45.8595	41.5747	38.3081	42.9351	44.8637	49.6566	55.0116	57.6579	(72)
Total internal gains	222.5698	220.6731	212.6804	200.2778	188.1303	176.0547	168.2704	172.8633	179.2508	191.8006	206.1320	216.5692	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c	Access factor Table 6d		Gains W
East					3.5500	19.6403	0.6300		0.7000	0.7700		21.3082 (76)
South					3.2400	46.7521	0.6300		0.7000	0.7700		46.2932 (78)
Solar gains	67.6015	117.4998	165.2233	209.2697	236.4410	235.0653	226.5306	206.5814	180.7246	131.2360	81.4421	57.5245 (83)
Total gains	290.1713	338.1730	377.9037	409.5475	424.5713	411.1200	394.8009	379.4447	359.9754	323.0366	287.5742	274.0937 (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	49.8934	50.0498	50.2040	50.9415	51.0819	51.7458	51.7458	51.8706	51.4880	51.0819	50.7987	50.5059	
alpha	4.3262	4.3367	4.3469	4.3961	4.4055	4.4497	4.4497	4.4580	4.4325	4.4055	4.3866	4.3671	
util living area	0.9923	0.9844	0.9667	0.9221	0.8284	0.6677	0.5055	0.5437	0.7695	0.9396	0.9851	0.9939	(86)
MIT	19.6549	19.8519	20.1407	20.4918	20.7724	20.9379	20.9856	20.9802	20.8794	20.5116	20.0202	19.6237	(87)
Th 2	19.7696	19.7729	19.7762	19.7916	19.7945	19.8081	19.8081	19.8106	19.8028	19.7945	19.7887	19.7826	(88)
util rest of house	0.9897	0.9793	0.9554	0.8950	0.7698	0.5659	0.3756	0.4129	0.6785	0.9127	0.9792	0.9919	(89)
MIT 2	18.0223	18.3093	18.7248	19.2231	19.5833	19.7694	19.8033	19.8033	19.7153	19.2632	18.5663	17.9858	(90)
Living area fraction	18.9545	19.1901	19.5332	19.9475	20.2623	20.4366	20.4784	20.4753	20.3800	19.9760	19.3964	18.9210	(91)
MIT	18.9545	19.1901	19.5332	19.9475	20.2623	20.4366	20.4784	20.4753	20.3800	19.9760	19.3964	18.9210	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9545	19.1901	19.5332	19.9475	20.2623	20.4366	20.4784	20.4753	20.3800	19.9760	19.3964	18.9210	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9875	0.9762	0.9527	0.8990	0.7945	0.6219	0.4501	0.4878	0.7255	0.9175	0.9768	0.9900	(94)
Ext temp.	286.5352	330.1129	360.0140	368.1732	337.3187	255.6572	177.6919	185.0945	261.1716	296.3983	280.8932	271.3408	(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	708.3858	688.6129	626.1176	523.0378	404.2641	272.0348	180.7667	189.4858	294.1673	442.6846	583.8066	702.9703	(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	313.8568	240.9120	197.9811	111.5025	49.8073	0.0000	0.0000	0.0000	0.0000	108.8370	218.0977	321.1323	(98)
												1562.1267	(98)
												44.9792	(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													1672.5125 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	313.8568	240.9120	197.9811	111.5025	49.8073	0.0000	0.0000	0.0000	0.0000	108.8370	218.0977	321.1323	(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)	336.0351	257.9358	211.9712	119.3817	53.3269	0.0000	0.0000	0.0000	0.0000	116.5278	233.5093	343.8247	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	141.2995	123.4287	128.4196	113.9017	110.2770	97.1258	93.0539	103.7333	104.8789	119.4255	127.4844	137.9812	(64)
Efficiency of water heater	87.0028	86.7055	86.1374	84.9977	83.1919	80.3000	80.3000	80.3000	80.3000	84.8184	86.3915	87.1072	(216)
Fuel for water heating, kWh/month	162.4079	142.3541	149.0870	134.0057	132.5574	120.9537	115.8828	129.1822	130.6089	140.8015	147.5659	158.4039	(219)
Water heating fuel used												1663.8108	(219)
Annual totals kWh/year													
Space heating fuel - main system												1672.5125	(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)												172.5339	(232)
Total delivered energy for all uses												3583.8573	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1672.5125	0.2160	361.2627 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1663.8108	0.2160	359.3831 (264)
Space and water heating			720.6458 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	172.5339	0.5190	89.5451 (268)
Total CO2, kg/m2/year			849.1160 (272)
Emissions per m2 for space and water heating			20.7500 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.5783 (272b)
Emissions per m2 for pumps and fans			1.1208 (272c)
Target Carbon Dioxide Emission Rate (TER) = (20.7500 * 1.00) + 2.5783 + 1.1208, rounded to 2 d.p.			24.4500 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	0007-Conversion-Flat-3				Issued on Date	12/04/2022
Assessment Reference	Be Lean	Prop Type Ref	Conversion Flat 3			
Property	Conversion Flat 3, 233, London Road, East Reading, Reading, Berkshire, RG1 3NY					
SAP Rating		80 C	DER	27.60	TER	22.01
Environmental		84 B	% DER<TER	-25.38		
CO ₂ Emissions (t/year)		0.88	DFEE	72.80	TFEE	51.21
General Requirements Compliance		Fail	% DFEE<TFEE	-42.17		
Assessor Details	Mr. Andrew Taylor, Andrew Taylor, Tel: 01636 653 055, andy@mesbuildingsolutions.co.uk				Assessor ID	P741-0001
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 38 m²

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

1a TER and DER

Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 22.01 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 27.60 kgCO₂/m²Fail
Excess emissions =5.59 kgCO₂/m² (25.4%)

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)51.2 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)72.8 kWh/m²/yrFail
Excess energy =21.6 kWh/m²/yr (42.2%)

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.20 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	OK
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using default y-value of 0.15

3 Air permeability

Air permeability at 50 pascals: 15.00 (assumed) OK

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from manufacturer
tbc tbc
Combi boiler
Efficiency: 89%
Minimum: 88% OK

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Time and temperature zone control 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): Slight OK

Based on:

Overshading: Average
Windows facing North: 1.89 m², No overhang
Windows facing East: 2.84 m², No overhang
Windows facing South: 3.04 m², No overhang
Air change rate: 8.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.11 W/m²K
Roof U-value 0.11 W/m²K
Exposed floor U-value 0.12 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	38.4300 (1b)	x 2.3300 (2b)	= 89.5419 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	38.4300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 89.5419 (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) = 0.2234 (8)
Pressure test					No
Measured/design AP50					15.0000
Infiltration rate					0.9734 (18)
Number of sides sheltered					2 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.8274 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	1.0549	1.0342	1.0135	0.9101	0.8894	0.7860	0.7860	0.7653	0.8274	0.8894	0.9308	0.9721 (22b)
Effective ac	1.0549	1.0342	1.0135	0.9141	0.8955	0.8089	0.8089	0.7928	0.8423	0.8955	0.9332	0.9725 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.40)			5.8800	1.3258	7.7955		(27)
Door			1.8900	1.4000	2.6460		(26)
Glazed Door (Uw = 1.40)			1.8900	1.3258	2.5057		(27)
REFURB - Floor to Stairwell			5.4500	0.1157	0.6305	110.0000	599.5000 (28b)
REFURB - External Wall	29.4500	9.6600	19.7900	0.2000	3.9580	190.0000	3760.1000 (29a)
REFURB - Wall onto Stairwell	14.4000		14.4000	0.2000	2.8800	18.0000	259.2000 (29a)
REFURB - External Plane Roof	33.1500		33.1500	0.1100	3.6465	9.0000	298.3500 (30)
REFURB - External Sloped Roof	5.9800		5.9800	0.1100	0.6578	9.0000	53.8200 (30)
Total net area of external elements Aum(A, m ²)			88.4300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	24.7200		(33)
Party Wall 1			14.6700	0.0000	0.0000	45.0000	660.1500 (32)
Party Floor 1			32.9800			30.0000	989.4000 (32d)
Stud			42.5000			9.0000	382.5000 (32c)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Default value 0.150 * total exposed area)
Total fabric heat loss

(28)...(30) + (32) + (32a)...(32e) = 7003.0200 (34)												
182.2279 (35)												
13.2645 (36)												
(33) + (36) = 37.9845 (37)												
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 31.1704	Feb 30.5592	Mar 29.9480	Apr 27.0115	May 26.4616	Jun 23.9017	Jul 23.9017	Aug 23.4276	Sep 24.8877	Oct 26.4616	Nov 27.5741	Dec 28.7371 (38)
Heat transfer coeff	69.1549	68.5437	67.9325	64.9960	64.4461	61.8862	61.8862	61.4121	62.8722	64.4461	65.5586	66.7216 (39)
Average = Sum(39)m / 12 =												64.9880 (39)
HLP	Jan 1.7995	Feb 1.7836	Mar 1.7677	Apr 1.6913	May 1.6770	Jun 1.6104	Jul 1.6104	Aug 1.5980	Sep 1.6360	Oct 1.6770	Nov 1.7059	Dec 1.7362 (40)
HLP (average)												1.6911 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.3653 (42)
Average daily hot water use (litres/day)												66.6250 (43)
Daily hot water use	Jan 73.2875	Feb 70.6225	Mar 67.9575	Apr 65.2925	May 62.6275	Jun 59.9625	Jul 59.9625	Aug 62.6275	Sep 65.2925	Oct 67.9575	Nov 70.6225	Dec 73.2875 (44)
Energy conte	108.6832	95.0550	98.0883	85.5157	82.0544	70.8067	65.6128	75.2916	76.1909	88.7931	96.9246	105.2539 (45)
Energy content (annual)										Total = Sum(45)m =		1048.2701 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	16.3025	14.2583	14.7132	12.8274	12.3082	10.6210	9.8419	11.2937	11.4286	13.3190	14.5387	15.7881 (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	37.3465	32.5057	34.6304	32.1990	31.9143	29.5705	30.5562	31.9143	32.1990	34.6304	34.8275	37.3465 (61)
Total heat required for water heating calculated for each month	146.0297	127.5607	132.7186	117.7147	113.9686	100.3772	96.1690	107.2059	108.3899	123.4235	131.7521	142.6003 (62)
Solar input	0.0000	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	146.0297	127.5607	132.7186	117.7147	113.9686	100.3772	96.1690	107.2059	108.3899	123.4235	131.7521	142.6003 (64)
Heat gains from water heating, kWh/month	45.4738	39.7322	41.2719	36.4837	35.2616	30.9359	29.4553	33.0130	33.3832	38.1813	40.9343	44.3335 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 1447.9103 (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	68.2631	68.2631	68.2631	68.2631	68.2631	68.2631	68.2631	68.2631	68.2631	68.2631	68.2631	68.2631 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	10.5470	9.3677	7.6183	5.7676	4.3113	3.6398	3.9329	5.1122	6.8616	8.7123	10.1686	10.8401 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	117.6061	118.8265	115.7512	109.2042	100.9397	93.1723	87.9832	86.7629	89.8382	96.3852	104.6496	112.4170 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.8263	29.8263	29.8263	29.8263	29.8263	29.8263	29.8263	29.8263	29.8263	29.8263	29.8263	29.8263 (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)	-54.6105	-54.6105	-54.6105	-54.6105	-54.6105	-54.6105	-54.6105	-54.6105	-54.6105	-54.6105	-54.6105	-54.6105 (71)
Water heating gains (Table 5)	61.1207	59.1253	55.4730	50.6718	47.3947	42.9665	39.5905	44.3724	46.3656	51.3190	56.8532	59.5881 (72)
Total internal gains	235.7527	233.7984	225.3215	212.1225	199.1247	186.2575	177.9856	182.7263	189.5443	202.8954	218.1503	229.3241 (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				2.8400	19.6403		0.6300		0.7000		0.7700		17.0466 (76)
South				3.0400	46.7521		0.6300		0.7000		0.7700		43.4356 (78)
North				1.8900	10.6334		0.6300		0.7000		0.7700		6.1419 (74)
Solar gains	66.6242	116.2207	165.4775	214.5452	248.0368	249.3881	239.1467	213.8479	182.5097	130.2680	80.3180	56.6709	(83)
Total gains	302.3768	350.0191	390.7989	426.6677	447.1614	435.6457	417.1323	396.5743	372.0539	333.1634	298.4683	285.9950	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	28.1294	28.3802	28.6355	29.9293	30.1846	31.4332	31.4332	31.6759	30.9403	30.1846	29.6724	29.1552
alpha	2.8753	2.8920	2.9090	2.9953	3.0123	3.0955	3.0955	3.1117	3.0627	3.0123	2.9782	2.9437
util living area	0.9843	0.9751	0.9579	0.9198	0.8480	0.7187	0.5795	0.6175	0.8084	0.9348	0.9755	0.9866 (86)
MIT	18.6825	18.9327	19.3385	19.9111	20.3898	20.7668	20.9141	20.8940	20.6280	20.0055	19.2914	18.7032 (87)
Th 2	19.4703	19.4815	19.4927	19.5471	19.5574	19.6057	19.6057	19.6148	19.5870	19.5574	19.5366	19.5150 (88)
util rest of house	0.9799	0.9682	0.9457	0.8947	0.7953	0.6161	0.4249	0.4676	0.7247	0.9093	0.9676	0.9829 (89)
MIT 2	16.4897	16.8576	17.4481	18.2911	18.9454	19.4354	19.5696	19.5653	19.2785	18.4437	17.4118	16.5442 (90)
Living area fraction									fLA = Living area / (4) =			0.5746 (91)
MIT	17.7496	18.0498	18.5342	19.2219	19.7753	20.2004	20.3421	20.3287	20.0539	19.3410	18.4917	17.7847 (92)
Temperature adjustment												-0.1500
adjusted MIT	17.5996	17.8998	18.3842	19.0719	19.6253	20.0504	20.1921	20.1787	19.9039	19.1910	18.3417	17.6347 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9722	0.9582	0.9336	0.8844	0.7983	0.6523	0.4945	0.5337	0.7465	0.9008	0.9586	0.9762 (94)
Ext temp.	293.9783	335.3843	364.8467	377.3381	356.9473	284.1867	206.2844	211.6360	277.7358	300.1282	286.0978	279.1742 (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	919.7299	891.0565	807.3256	661.1312	510.7541	337.3022	222.2985	232.0591	364.9024	553.6576	736.9916	896.3829 (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	465.5592	373.4117	329.2043	204.3310	114.4322	0.0000	0.0000	0.0000	0.0000	188.6259	324.6435	459.2032 (98)
Space heating per m2												2459.4111 (98)
												(98) / (4) = 63.9972 (99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													89.0000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2763.3833 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	465.5592	373.4117	329.2043	204.3310	114.4322	0.0000	0.0000	0.0000	0.0000	188.6259	324.6435	459.2032	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	523.1003	419.5637	369.8925	229.5854	128.5756	0.0000	0.0000	0.0000	0.0000	211.9392	364.7680	515.9587	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	146.0297	127.5607	132.7186	117.7147	113.9686	100.3772	96.1690	107.2059	108.3899	123.4235	131.7521	142.6003	(64)
Efficiency of water heater (217)m	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	(216)
Fuel for water heating, kWh/month	164.0783	143.3266	149.1221	132.2638	128.0546	112.7834	108.0551	120.4561	121.7864	138.6781	148.0361	160.2251	(219)
Water heating fuel used													1626.8656 (219)
Annual totals kWh/year													
Space heating fuel - main system													2763.3833 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
central heating pump													30.0000 (230c)
Total electricity for the above, kWh/year													30.0000 (231)
Electricity for lighting (calculated in Appendix L)													186.2627 (232)
Total delivered energy for all uses													4606.5115 (238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2763.3833	0.2160	596.8908 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1626.8656	0.2160	351.4030 (264)
Space and water heating			948.2938 (265)
Pumps and fans	30.0000	0.5190	15.5700 (267)
Energy for lighting	186.2627	0.5190	96.6703 (268)
Total CO2, kg/year			1060.5341 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			27.6000 (273)

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

DER		27.6000	ZC1
Total Floor Area	TFA	38.4300	
Assumed number of occupants	N	1.3653	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		18.1345	ZC2
CO2 emissions from cooking, equation (L16)		3.9492	ZC3
Total CO2 emissions		49.6837	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		49.6837	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	38.4300 (1b)	x 2.3300 (2b)	= 89.5419 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	38.4300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 89.5419 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	+	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				2 * 10 =	20.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					20.0000 / (5) =
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4734 (18)
					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.4024 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
	0.5130	0.5029	0.4929	0.4426	0.4325	0.3822	0.3822	0.3722	0.4024	0.4325	0.4526	0.4728 (22b)
Effective ac	0.6316	0.6265	0.6215	0.5979	0.5935	0.5731	0.5731	0.5693	0.5809	0.5935	0.6024	0.6118 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			7.7200	1.3258	10.2348		(27)
REFURB - Floor to Stairwell			5.4500	0.1300	0.7085		(28b)
REFURB - External Wall	29.4500	9.6100	19.8400	0.1800	3.5712		(29a)
REFURB - Wall onto Stairwell	14.4000		14.4000	0.1800	2.5920		(29a)
REFURB - External Plane Roof	33.1500		33.1500	0.1300	4.3095		(30)
REFURB - External Sloped Roof	5.9800		5.9800	0.1300	0.7774		(30)
Total net area of external elements Aum(A, m ²)			88.4300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	24.0834		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (User defined value 0.050 * total exposed area)							4.4215 (36)
Total fabric heat loss						(33) + (36) =	28.5049 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	18.6626	18.5116	18.3636	17.6685	17.5385	16.9330	16.9330	16.8209	17.1662	17.5385	17.8016	18.0766 (38)
Heat transfer coeff	47.1676	47.0166	46.8686	46.1735	46.0434	45.4380	45.4380	45.3259	45.6712	46.0434	46.3065	46.5816 (39)
Average = Sum(39)m / 12 =												46.1728 (39)
HLP	1.2274	1.2234	1.2196	1.2015	1.1981	1.1824	1.1824	1.1794	1.1884	1.1981	1.2050	1.2121 (40)
HLP (average)												1.2015 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.3653 (42)
Average daily hot water use (litres/day)												66.6250 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	73.2875	70.6225	67.9575	65.2925	62.6275	59.9625	59.9625	62.6275	65.2925	67.9575	70.6225	73.2875 (44)
Energy conte	108.6832	95.0550	98.0883	85.5157	82.0544	70.8067	65.6128	75.2916	76.1909	88.7931	96.9246	105.2539 (45)
Energy content (annual)										Total = Sum(45)m =		1048.2701 (45)
Distribution loss (46)m = 0.15 x (45)m	16.3025	14.2583	14.7132	12.8274	12.3082	10.6210	9.8419	11.2937	11.4286	13.3190	14.5387	15.7881 (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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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	0.0000 (57)
Combi loss	37.3465	32.5057	34.6304	32.1990	31.9143	29.5705	30.5562	31.9143	32.1990	34.6304	34.8275	37.3465	(61)
Total heat required for water heating calculated for each month	146.0297	127.5607	132.7186	117.7147	113.9686	100.3772	96.1690	107.2059	108.3899	123.4235	131.7521	142.6003	(62)
Solar input	0.0000	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	146.0297	127.5607	132.7186	117.7147	113.9686	100.3772	96.1690	107.2059	108.3899	123.4235	131.7521	142.6003	(64)
Heat gains from water heating, kWh/month	45.4738	39.7322	41.2719	36.4837	35.2616	30.9359	29.4553	33.0130	33.3832	38.1813	40.9343	44.3335	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	68.2631	68.2631	68.2631	68.2631	68.2631	68.2631	68.2631	68.2631	68.2631	68.2631	68.2631	68.2631	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	10.5537	9.3737	7.6232	5.7713	4.3141	3.6421	3.9355	5.1155	6.8660	8.7179	10.1751	10.8471	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	117.6061	118.8265	115.7512	109.2042	100.9397	93.1723	87.9832	86.7629	89.8382	96.3852	104.6496	112.4170	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.8263	29.8263	29.8263	29.8263	29.8263	29.8263	29.8263	29.8263	29.8263	29.8263	29.8263	29.8263	(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)	-54.6105	-54.6105	-54.6105	-54.6105	-54.6105	-54.6105	-54.6105	-54.6105	-54.6105	-54.6105	-54.6105	-54.6105	(71)
Water heating gains (Table 5)	61.1207	59.1253	55.4730	50.6718	47.3947	42.9665	39.5905	44.3724	46.3656	51.3190	56.8532	59.5881	(72)
Total internal gains	235.7594	233.8044	225.3263	212.1262	199.1274	186.2599	177.9881	182.7296	189.5487	202.9010	218.1569	229.3311	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W		
North				1.8800	10.6334	0.6300	0.7000	0.7700		6.1094 (74)		
East				2.8200	19.6403	0.6300	0.7000	0.7700		16.9265 (76)		
South				3.0200	46.7521	0.6300	0.7000	0.7700		43.1499 (78)		
Solar gains	66.1859	115.4557	164.3890	213.1379	246.4150	247.7604	237.5846	212.4470	181.3102	129.4107	79.7895	56.2982 (83)
Total gains	301.9453	349.2602	389.7154	425.2641	445.5425	434.0202	415.5727	395.1766	370.8589	332.3116	297.9464	285.6292 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	56.5802	56.7619	56.9411	57.7983	57.9616	58.7339	58.7339	58.8792	58.4340	57.9616	57.6323	57.2920	
alpha	4.7720	4.7841	4.7961	4.8532	4.8641	4.9156	4.9156	4.9253	4.8956	4.8641	4.8422	4.8195	
util living area	0.9936	0.9865	0.9691	0.9204	0.8126	0.6360	0.4742	0.5167	0.7565	0.9413	0.9870	0.9951	(86)
MIT	19.8248	20.0054	20.2714	20.5949	20.8397	20.9641	20.9930	20.9895	20.9161	20.5978	20.1541	19.7957	(87)
Th 2	19.8982	19.9013	19.9044	19.9188	19.9215	19.9341	19.9341	19.9365	19.9293	19.9215	19.9160	19.9103	(88)
util rest of house	0.9915	0.9822	0.9590	0.8942	0.7557	0.5439	0.3629	0.4028	0.6713	0.9163	0.9820	0.9934	(89)
MIT 2	18.3581	18.6217	19.0048	19.4631	19.7730	19.9117	19.9317	19.9325	19.8679	19.4790	18.8497	18.3245	(90)
Living area fraction	19.2008	19.4168	19.7325	20.1134	20.3859	20.5163	20.5415	20.5398	20.4701	20.1218	19.5992	19.1698	(92)
Temperature adjustment	19.2008	19.4168	19.7325	20.1134	20.3859	20.5163	20.5415	20.5398	20.4701	20.1218	19.5992	19.1698	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9898	0.9798	0.9571	0.8995	0.7818	0.5956	0.4270	0.4684	0.7168	0.9217	0.9801	0.9920	(94)
Ext temp.	298.8660	342.1989	372.9836	382.5269	348.3246	258.5076	177.4554	185.0941	265.8218	306.2930	292.0205	283.3320	(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	702.8328	682.5282	620.1904	517.7620	399.9272	268.8267	179.0931	187.6395	290.9314	438.4169	578.7926	697.3170	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating per m2	300.5514	228.7013	183.9219	97.3693	38.3923	0.0000	0.0000	0.0000	0.0000	98.3002	206.4759	308.0049	(98)
												1461.7170	(98)
												38.0358	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1565.0075 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	300.5514	228.7013	183.9219	97.3693	38.3923	0.0000	0.0000	0.0000	0.0000	98.3002	206.4759	308.0049	(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)	321.7895	244.8622	196.9185	104.2498	41.1053	0.0000	0.0000	0.0000	0.0000	105.2464	221.0662	329.7697	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	146.0297	127.5607	132.7186	117.7147	113.9686	100.3772	96.1690	107.2059	108.3899	123.4235	131.7521	142.6003	(64)
Efficiency of water heater (217)m	86.8288	86.5043	85.8728	84.5778	82.6262	80.3000	80.3000	80.3000	80.3000	84.4848	86.1777	86.9394	(216)
Fuel for water heating, kWh/month	168.1811	147.4618	154.5525	139.1792	137.9329	125.0028	119.7622	133.5067	134.9812	146.0896	152.8842	164.0226	(219)
Water heating fuel used												1723.5567	(219)
Annual totals kWh/year													
Space heating fuel - main system												1565.0075	(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)												186.3822	(232)
Total delivered energy for all uses												3549.9464	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1565.0075	0.2160	338.0416 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1723.5567	0.2160	372.2882 (264)
Space and water heating			710.3299 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	186.3822	0.5190	96.7323 (268)
Total CO2, kg/m2/year			845.9872 (272)
Emissions per m2 for space and water heating			18.4837 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.5171 (272b)
Emissions per m2 for pumps and fans			1.0129 (272c)
Target Carbon Dioxide Emission Rate (TER) = (18.4837 * 1.00) + 2.5171 + 1.0129, rounded to 2 d.p.			22.0100 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	0007-New-Build-Flat-1			Issued on Date	12/04/2022
Assessment Reference	Be Clean	Prop Type Ref	New Build Flat 1		
Property	New Build Flat 1, 233, London Road, East Reading, Reading, Berkshire, RG1 3NY				
SAP Rating	83 B	DER	18.35	TER	20.74
Environmental	87 B	% DER<TER	11.53		
CO ₂ Emissions (t/year)	0.93	DFEE	40.67	TFEE	57.93
General Requirements Compliance	Pass	% DFEE<TFEE	29.80		
Assessor Details	Mr. Andrew Taylor, Andrew Taylor, Tel: 01636 653 055, andy@mesbuildingsolutions.co.uk			Assessor ID	P741-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

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

DWELLING AS DESIGNED

Ground-floor flat, total floor area 61 m²

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

1a TER and DER

Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 20.74 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 18.35 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)57.9 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)40.7 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.28 (max. 2.00)	1.80 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.039

3 Air permeability

Air permeability at 50 pascals: 5.10 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from manufacturer
tbc tbc
Combi boiler
Efficiency: 89%
Minimum: 88% OK

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Time and temperature zone control 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): Slight OK
Based on:
Overshading: Average
Windows facing North: 2.70 m², No overhang
Windows facing East: 5.62 m², No overhang
Windows facing South: 3.15 m², No overhang
Air change rate: 6.00 ach
Blinds/curtains: None

10 Key features

Roof U-value 0.10 W/m²K
Floor U-value 0.10 W/m²K
Thermal bridging y-value 0.039 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	61.3400 (1b)	x 2.4000 (2b)	= 147.2160 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.3400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 147.2160 (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) = 0.1359 (8)
Pressure test					Yes
Measured/design AP50					5.1000
Infiltration rate					0.3909 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3322 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4236	0.4153	0.4070	0.3654	0.3571	0.3156	0.3156	0.3073	0.3322	0.3571	0.3738	0.3904 (22b)
Effective ac	0.5897	0.5862	0.5828	0.5668	0.5638	0.5498	0.5498	0.5472	0.5552	0.5638	0.5698	0.5762 (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
Window (Uw = 1.20)			8.3200	1.1450	9.5267		(27)
Door			1.8900	1.8000	3.4020		(26)
Glazed Door (Uw = 1.20)			3.1500	1.1450	3.6069		(27)
Ground Floor			61.3400	0.1000	6.1340	110.0000	6747.4000 (28a)
External Wall	83.7600	13.3600	70.4000	0.1500	10.5600	60.0000	4224.0000 (29a)
Flat Roof to Stairwell	3.3200		3.3200	0.0970	0.3220	9.0000	29.8800 (30)
Total net area of external elements Aum(A, m ²)			148.4200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.5516		(33)
Party Ceilings			58.0100			30.0000	1740.3000 (32b)
Stud			86.6400			9.0000	779.7600 (32c)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			13521.3400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							220.4327 (35)
Thermal bridges (User defined value 0.039 * total exposed area)							5.7884 (36)
Total fabric heat loss						(33) + (36) =	39.3400 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	28.6490	28.4798	28.3139	27.5347	27.3889	26.7103	26.7103	26.5846	26.9717	27.3889	27.6839	27.9922 (38)
Heat transfer coeff	67.9890	67.8198	67.6539	66.8747	66.7289	66.0503	66.0503	65.9246	66.3117	66.7289	67.0239	67.3322 (39)
Average = Sum(39)m / 12 =												66.8740 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1084	1.1056	1.1029	1.0902	1.0879	1.0768	1.0768	1.0747	1.0811	1.0879	1.0927	1.0977 (40)
HLP (average)												1.0902 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0193 (42)
Average daily hot water use (litres/day)												82.1574 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	90.3731	87.0868	83.8005	80.5142	77.2279	73.9416	73.9416	77.2279	80.5142	83.8005	87.0868	90.3731 (44)
Energy conte	134.0207	117.2153	120.9557	105.4521	101.1838	87.3140	80.9092	92.8445	93.9534	109.4936	119.5208	129.7919 (45)
Energy content (annual)										Total = Sum(45)m =		1292.6551 (45)
Distribution loss (46)m = 0.15 x (45)m												
	20.1031	17.5823	18.1434	15.8178	15.1776	13.0971	12.1364	13.9267	14.0930	16.4240	17.9281	19.4688 (46)
Water storage loss:												

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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	46.0531	40.0838	42.7038	39.7056	39.3545	36.4644	37.6798	39.3545	39.7056	42.7038	42.9469	46.0531 (61)
Total heat required for water heating calculated for each month	180.0738	157.2991	163.6596	145.1578	140.5383	123.7783	118.5891	132.1990	133.6590	152.1974	162.4677	175.8450 (62)
Solar input	0.0000	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	180.0738	157.2991	163.6596	145.1578	140.5383	123.7783	118.5891	132.1990	133.6590	152.1974	162.4677	175.8450 (64)
Heat gains from water heating, kWh/month	56.0752	48.9950	50.8937	44.9892	43.4823	38.1480	36.3223	40.7094	41.1659	47.0826	50.4774	54.6691 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	100.9629	100.9629	100.9629	100.9629	100.9629	100.9629	100.9629	100.9629	100.9629	100.9629	100.9629	100.9629 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	15.9619	14.1772	11.5297	8.7287	6.5248	5.5085	5.9522	7.7368	10.3844	13.1854	15.3893	16.4055 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	176.3134	178.1429	173.5325	163.7173	151.3274	139.6826	131.9032	130.0736	134.6841	144.4993	156.8892	168.5339 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.0963	33.0963	33.0963	33.0963	33.0963	33.0963	33.0963	33.0963	33.0963	33.0963	33.0963	33.0963 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-80.7703	-80.7703	-80.7703	-80.7703	-80.7703	-80.7703	-80.7703	-80.7703	-80.7703	-80.7703	-80.7703	-80.7703 (71)
Water heating gains (Table 5)	75.3698	72.9093	68.4056	62.4851	58.4439	52.9833	48.8203	54.7170	57.1749	63.2830	70.1075	73.4799 (72)
Total internal gains	323.9340	321.5183	309.7566	291.2199	272.5849	254.4633	242.9645	248.8163	258.5322	277.2565	298.6748	314.7083 (73)

6. Solar gains

[Jan]												
					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c	Access factor Table 6d		Gains W
North					2.7000	10.6334	0.6300		0.7000	0.7700		8.7742 (74)
East					5.6200	19.6403	0.6300		0.7000	0.7700		33.7330 (76)
South					3.1500	46.7521	0.6300		0.7000	0.7700		45.0073 (78)
Solar gains	87.5146	156.4673	231.0612	310.3826	366.4781	371.2637	354.9056	312.4774	258.7338	177.7651	106.2343	73.9455 (83)
Total gains	411.4485	477.9856	540.8178	601.6025	639.0630	625.7270	597.8701	561.2937	517.2660	455.0216	404.9091	388.6538 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	55.2431	55.3810	55.5168	56.1636	56.2863	56.8647	56.8647	56.9731	56.6405	56.2863	56.0387	55.7821
alpha	4.6829	4.6921	4.7011	4.7442	4.7524	4.7910	4.7910	4.7982	4.7760	4.7524	4.7359	4.7188
util living area	0.9945	0.9882	0.9718	0.9231	0.8138	0.6382	0.4781	0.5270	0.7726	0.9492	0.9890	0.9957 (86)
MIT	19.7631	19.9442	20.2234	20.5661	20.8281	20.9600	20.9918	20.9872	20.9008	20.5518	20.0924	19.7297 (87)
Th 2	19.9940	19.9962	19.9984	20.0088	20.0108	20.0198	20.0198	20.0215	20.0163	20.0108	20.0068	20.0027 (88)
util rest of house	0.9929	0.9849	0.9634	0.9005	0.7629	0.5546	0.3756	0.4213	0.6971	0.9293	0.9852	0.9945 (89)
MIT 2	18.3513	18.6157	19.0190	19.5051	19.8429	19.9923	20.0165	20.0158	19.9367	19.4970	18.8403	18.3089 (90)
Living area fraction	18.9264	19.1570	19.5097	19.9373	20.2443	20.3865	20.4138	20.4115	20.3295	19.9267	19.3504	18.8878 (92)
Temperature adjustment									fLA = Living area / (4) =			0.4074 (91)
adjusted MIT	18.7764	19.0070	19.3597	19.7873	20.0943	20.2365	20.2638	20.2615	20.1795	19.7767	19.2004	18.7378 (93)
												-0.1500

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	407.3890	468.5862	517.3639	538.1252	490.5783	359.1093	240.0964	251.4058	367.6974	420.2087	397.2100	385.6402 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	984.2390	956.7308	870.0073	728.0883	560.1412	372.2925	241.9972	254.5695	403.1421	612.3517	811.0134	978.8586 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	429.1764	328.0332	262.3666	136.7735	51.7548	0.0000	0.0000	0.0000	0.0000	142.9544	297.9385	441.3545 (98)
Space heating												2090.3518 (98)
Space heating per m2												34.0781 (99)

8c. Space cooling requirement

Not applicable

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													89.0000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2348.7099 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	429.1764	328.0332	262.3666	136.7735	51.7548	0.0000	0.0000	0.0000	0.0000	142.9544	297.9385	441.3545	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	482.2206	368.5766	294.7940	153.6780	58.1514	0.0000	0.0000	0.0000	0.0000	160.6229	334.7623	495.9039	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	180.0738	157.2991	163.6596	145.1578	140.5383	123.7783	118.5891	132.1990	133.6590	152.1974	162.4677	175.8450	(64)
Efficiency of water heater (217)m	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	(216)
Fuel for water heating, kWh/month	202.3301	176.7406	183.8871	163.0986	157.9082	139.0768	133.2461	148.5382	150.1787	171.0083	182.5480	197.5787	(219)
Water heating fuel used												2006.1395	(219)
Annual totals kWh/year													
Space heating fuel - main system												2348.7099	(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)												281.8924	(232)
Total delivered energy for all uses												4711.7418	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2348.7099	0.2160	507.3213 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2006.1395	0.2160	433.3261 (264)
Space and water heating			940.6475 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	281.8924	0.5190	146.3022 (268)
Total CO2, kg/year			1125.8746 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			18.3500 (273)

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

DER		18.3500	ZC1
Total Floor Area	TFA	61.3400	
Assumed number of occupants	N	2.0193	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.0329	ZC2
CO2 emissions from cooking, equation (L16)		2.7301	ZC3
Total CO2 emissions		38.1129	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		38.1129	ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	61.3400 (1b)	x 2.4000 (2b)	= 147.2160 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.3400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 147.2160 (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) = 0.1359 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3859 (18)
					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3280 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	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	0.4182	0.4100	0.4018	0.3608	0.3526	0.3116	0.3116	0.3034	0.3280	0.3526	0.3690	0.3854 (22b)
	0.5874	0.5840	0.5807	0.5651	0.5622	0.5485	0.5485	0.5460	0.5538	0.5622	0.5681	0.5743 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			11.4700	1.3258	15.2064		(27)
Ground Floor			61.3400	0.1300	7.9742		(28a)
External Wall	83.7600	13.3600	70.4000	0.1800	12.6720		(29a)
Flat Roof to Stairwell	3.3200		3.3200	0.1300	0.4316		(30)
Total net area of external elements Aum(A, m ²)			148.4200				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	38.1742	(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)							11.6345 (36)
Total fabric heat loss						(33) + (36) =	49.8087 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	28.5383	28.3733	28.2116	27.4523	27.3102	26.6488	26.6488	26.5263	26.9036	27.3102	27.5976	27.8981 (38)
Heat transfer coeff												
Average = Sum(39)m / 12 =	78.3470	78.1821	78.0204	77.2610	77.1189	76.4575	76.4575	76.3351	76.7123	77.1189	77.4063	77.7068 (39)
												77.2603 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2773	1.2746	1.2719	1.2596	1.2572	1.2465	1.2465	1.2445	1.2506	1.2572	1.2619	1.2668 (40)
HLP (average)												1.2595 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0193 (42)
Average daily hot water use (litres/day)												82.1574 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	90.3731	87.0868	83.8005	80.5142	77.2279	73.9416	73.9416	77.2279	80.5142	83.8005	87.0868	90.3731 (44)
Energy conte	134.0207	117.2153	120.9557	105.4521	101.1838	87.3140	80.9092	92.8445	93.9534	109.4936	119.5208	129.7919 (45)
Energy content (annual)												Total = Sum(45)m = 1292.6551 (45)
Distribution loss (46)m = 0.15 x (45)m	20.1031	17.5823	18.1434	15.8178	15.1776	13.0971	12.1364	13.9267	14.0930	16.4240	17.9281	19.4688 (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)

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Combi loss	46.0531	40.0838	42.7038	39.7056	39.3545	36.4644	37.6798	39.3545	39.7056	42.7038	42.9469	46.0531 (61)
Total heat required for water heating calculated for each month	180.0738	157.2991	163.6596	145.1578	140.5383	123.7783	118.5891	132.1990	133.6590	152.1974	162.4677	175.8450 (62)
Solar input	0.0000	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	180.0738	157.2991	163.6596	145.1578	140.5383	123.7783	118.5891	132.1990	133.6590	152.1974	162.4677	175.8450 (64)
Heat gains from water heating, kWh/month	56.0752	48.9950	50.8937	44.9892	43.4823	38.1480	36.3223	40.7094	41.1659	47.0826	50.4774	54.6691 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	100.9629	100.9629	100.9629	100.9629	100.9629	100.9629	100.9629	100.9629	100.9629	100.9629	100.9629	100.9629 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	15.9619	14.1772	11.5297	8.7287	6.5248	5.5085	5.9522	7.7368	10.3844	13.1854	15.3893	16.4055 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	176.3134	178.1429	173.5325	163.7173	151.3274	139.6826	131.9032	130.0736	134.6841	144.4993	156.8892	168.5339 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.0963	33.0963	33.0963	33.0963	33.0963	33.0963	33.0963	33.0963	33.0963	33.0963	33.0963	33.0963 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-80.7703	-80.7703	-80.7703	-80.7703	-80.7703	-80.7703	-80.7703	-80.7703	-80.7703	-80.7703	-80.7703	-80.7703 (71)
Water heating gains (Table 5)	75.3698	72.9093	68.4056	62.4851	58.4439	52.9833	48.8203	54.7170	57.1749	63.2830	70.1075	73.4799 (72)
Total internal gains	323.9340	321.5183	309.7566	291.2199	272.5849	254.4633	242.9645	248.8163	258.5322	277.2565	298.6748	314.7083 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W
North	2.7000	10.6334	0.6300		0.7000	0.7700	8.7742 (74)
East	5.6200	19.6403	0.6300		0.7000	0.7700	33.7330 (76)
South	3.1500	46.7521	0.6300		0.7000	0.7700	45.0073 (78)

Solar gains	87.5146	156.4673	231.0612	310.3826	366.4781	371.2637	354.9056	312.4774	258.7338	177.7651	106.2343	73.9455 (83)
Total gains	411.4485	477.9856	540.8178	601.6025	639.0630	625.7270	597.8701	561.2937	517.2660	455.0216	404.9091	388.6538 (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	54.3700	54.4847	54.5976	55.1342	55.2358	55.7136	55.7136	55.8030	55.5285	55.2358	55.0307	54.8179
alpha	4.6247	4.6323	4.6398	4.6756	4.6824	4.7142	4.7142	4.7202	4.7019	4.6824	4.6687	4.6545
util living area	0.9967	0.9930	0.9827	0.9506	0.8680	0.7111	0.5457	0.5981	0.8340	0.9683	0.9935	0.9975 (86)
MIT	19.6558	19.8261	20.1016	20.4551	20.7559	20.9333	20.9847	20.9768	20.8528	20.4572	19.9891	19.6241 (87)
Th 2	19.8587	19.8608	19.8629	19.8727	19.8745	19.8830	19.8830	19.8846	19.8797	19.8745	19.8708	19.8669 (88)
util rest of house	0.9956	0.9906	0.9765	0.9319	0.8184	0.6139	0.4157	0.4665	0.7557	0.9526	0.9908	0.9966 (89)
MIT 2	18.0849	18.3343	18.7343	19.2413	19.6382	19.8394	19.8776	19.8754	19.7642	19.2547	18.5800	18.0443 (90)
Living area fraction									fLA = Living area / (4) =			0.4074 (91)
MIT	18.7249	18.9420	19.2913	19.7358	20.0936	20.2850	20.3286	20.3241	20.2077	19.7446	19.1541	18.6879 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7249	18.9420	19.2913	19.7358	20.0936	20.2850	20.3286	20.3241	20.2077	19.7446	19.1541	18.6879 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	408.9949	472.1998	525.9104	558.9561	529.9455	407.4456	280.4731	292.1338	404.2462	432.3981	400.2167	386.8475 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1130.1471	1097.8358	997.9845	837.1867	647.3027	434.6624	285.0831	299.5463	468.5334	705.2216	933.0609	1125.8073 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	536.5373	420.4274	351.2232	200.3260	87.3137	0.0000	0.0000	0.0000	0.0000	202.9807	383.6478	549.7861 (98)
Space heating												2732.2423 (98)
Space heating per m2												44.5426 (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													2925.3130 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	536.5373	420.4274	351.2232	200.3260	87.3137	0.0000	0.0000	0.0000	0.0000	202.9807	383.6478	549.7861	(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)	574.4511	450.1364	376.0419	214.4818	93.4837	0.0000	0.0000	0.0000	0.0000	217.3241	410.7579	588.6361	(211)
Water heating requirement	0.0000	0.0000	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	180.0738	157.2991	163.6596	145.1578	140.5383	123.7783	118.5891	132.1990	133.6590	152.1974	162.4677	175.8450	(64)
Efficiency of water heater	87.6303	87.4067	86.9248	85.8624	83.8917	80.3000	80.3000	80.3000	80.3000	85.7769	87.1394	87.7261	(217)
Fuel for water heating, kWh/month	205.4926	179.9624	188.2772	169.0585	167.5235	154.1449	147.6825	164.6314	166.4496	177.4341	186.4459	200.4478	(219)
Water heating fuel used												2107.5503	(219)
Annual totals kWh/year													
Space heating fuel - main system												2925.3130	(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)												281.8924	(232)
Total delivered energy for all uses												5389.7557	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2925.3130	0.2160	631.8676 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2107.5503	0.2160	455.2309 (264)
Space and water heating			1087.0985 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	281.8924	0.5190	146.3022 (268)
Total CO2, kg/m2/year			1272.3256 (272)
Emissions per m2 for space and water heating			17.7225 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3851 (272b)
Emissions per m2 for pumps and fans			0.6346 (272c)
Target Carbon Dioxide Emission Rate (TER) = (17.7225 * 1.00) + 2.3851 + 0.6346, rounded to 2 d.p.			20.7400 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	0007-New-Build-Flat-2			Issued on Date	12/04/2022
Assessment Reference	Be Clean	Prop Type Ref	New Build Flat 2		
Property	New Build Flat 2, 233, London Road, East Reading, Reading, Berkshire, RG1 3NY				
SAP Rating	84 B	DER	17.31	TER	19.52
Environmental	88 B	% DER<TER	11.32		
CO ₂ Emissions (t/year)	0.86	DFEE	35.49	TFEE	50.31
General Requirements Compliance	Pass	% DFEE<TFEE	29.46		
Assessor Details	Mr. Andrew Taylor, Andrew Taylor, Tel: 01636 653 055, andy@mesbuildingsolutions.co.uk			Assessor ID	P741-0001
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 58 m²

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

1a TER and DER

Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 19.52 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 17.31 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)50.3 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)35.5 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Floor (no floor)			
Roof	0.08 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.23 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.048

3 Air permeability

Air permeability at 50 pascals:	5.10 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from manufacturer
tbc tbc
Combi boiler
Efficiency: 89%
Minimum: 88% OK

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Time and temperature zone control 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): Slight OK
Based on:
Overshading: Average
Windows facing North: 2.70 m², No overhang
Windows facing East: 5.62 m², No overhang
Windows facing South: 3.15 m², No overhang
Air change rate: 6.00 ach
Blinds/curtains: None

10 Key features

External wall U-value	0.14 W/m ² K
Roof U-value	0.10 W/m ² K
Roof U-value	0.08 W/m ² K

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	58.0100 (1b)	x 2.4000 (2b)	= 139.2240 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	58.0100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 139.2240 (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) = 0.1437 (8)
Pressure test					Yes
Measured/design AP50					5.1000
Infiltration rate					0.3987 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3389 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	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	0.4320	0.4236	0.4151	0.3727	0.3643	0.3219	0.3219	0.3134	0.3389	0.3643	0.3812	0.3982 (22b)
	0.5933	0.5897	0.5862	0.5695	0.5663	0.5518	0.5518	0.5491	0.5574	0.5663	0.5727	0.5793 (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
Window (Uw = 1.20)			8.3200	1.1450	9.5267		(27)
Glazed Door (Uw = 1.20)			3.1500	1.1450	3.6069		(27)
Door to Corridor			1.8900	1.4000	2.6460		(26)
External Wall	71.3000	11.4700	59.8300	0.1500	8.9745	60.0000	3589.8000 (29a)
Wall onto Stairwell	6.9400	1.8900	5.0500	0.1342	0.6776	9.0000	45.4500 (29a)
Flat Roof to Stairwell	3.3100		3.3100	0.0970	0.3210	9.0000	29.7900 (30)
Roof onto Roof Space	14.0400		14.0400	0.0769	1.0800	9.0000	126.3600 (30)
Total net area of external elements Aum(A, m ²)			95.5900				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.8327		(33)
Party Floor			58.0100			30.0000	1740.3000 (32d)
Party Ceiling			40.6700			30.0000	1220.1000 (32b)
Stud			73.6400			9.0000	662.7600 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 7414.5600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							127.8152 (35)
Thermal bridges (User defined value 0.048 * total exposed area)							4.5883 (36)
Total fabric heat loss							(33) + (36) = 31.4210 (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	27.2599	27.0934	26.9302	26.1636	26.0202	25.3525	25.3525	25.2288	25.6097	26.0202	26.3103	26.6136 (38)
Heat transfer coeff	58.6809	58.5144	58.3512	57.5846	57.4412	56.7735	56.7735	56.6499	57.0307	57.4412	57.7314	58.0347 (39)
Average = Sum(39)m / 12 =												57.5839 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0116	1.0087	1.0059	0.9927	0.9902	0.9787	0.9787	0.9766	0.9831	0.9902	0.9952	1.0004 (40)
HLP (average)												0.9927 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.9248 (42)
Average daily hot water use (litres/day)												79.9151 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	87.9066	84.7100	81.5134	78.3168	75.1202	71.9236	71.9236	75.1202	78.3168	81.5134	84.7100	87.9066 (44)
Energy conte	130.3630	114.0163	117.6546	102.5741	98.4223	84.9310	78.7010	90.3106	91.3892	106.5053	116.2588	126.2496 (45)
Energy content (annual)												Total = Sum(45)m = 1257.3758 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	19.5544	17.1024	17.6482	15.3861	14.7633	12.7396	11.8052	13.5466	13.7084	15.9758	17.4388	18.9374 (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	44.7962	38.9898	41.5383	38.6220	38.2804	35.4692	36.6515	38.2804	38.6220	41.5383	41.7748	44.7962 (61)
Total heat required for water heating calculated for each month	175.1592	153.0061	159.1929	141.1961	136.7027	120.4001	115.3525	128.5910	130.0112	148.0436	158.0336	171.0458 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h	175.1592	153.0061	159.1929	141.1961	136.7027	120.4001	115.3525	128.5910	130.0112	148.0436	158.0336	171.0458 (64)
Heat gains from water heating, kWh/month	54.5448	47.6579	49.5047	43.7614	42.2955	37.1068	35.3310	39.5984	40.0424	45.7976	49.0998	53.1770 (65)
Total per year (kWh/year) = Sum(64)m =												1736.7351 (64)

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

Metabolic gains (Table 5), Watts												
(66)m	96.2423	96.2423	96.2423	96.2423	96.2423	96.2423	96.2423	96.2423	96.2423	96.2423	96.2423	96.2423 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	15.0926	13.4051	10.9018	8.2534	6.1695	5.2085	5.6280	7.3155	9.8188	12.4673	14.5512	15.5121 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	167.9017	169.6440	165.2535	155.9065	144.1078	133.0186	125.6103	123.8680	128.2585	137.6054	149.4042	160.4934 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.6242	32.6242	32.6242	32.6242	32.6242	32.6242	32.6242	32.6242	32.6242	32.6242	32.6242	32.6242 (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)	-76.9939	-76.9939	-76.9939	-76.9939	-76.9939	-76.9939	-76.9939	-76.9939	-76.9939	-76.9939	-76.9939	-76.9939 (71)
Water heating gains (Table 5)	73.3128	70.9194	66.5386	60.7797	56.8488	51.5373	47.4879	53.2236	55.6144	61.5559	68.1941	71.4745 (72)
Total internal gains	311.1798	308.8413	297.5666	279.8123	261.9988	244.6371	233.5988	239.2798	248.5645	266.5013	287.0222	302.3527 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North				2.7000	10.6334	0.6300	0.7000	0.7700	8.7742 (74)			
East				5.6200	19.6403	0.6300	0.7000	0.7700	33.7330 (76)			
South				3.1500	46.7521	0.6300	0.7000	0.7700	45.0073 (78)			
Solar gains	87.5146	156.4673	231.0612	310.3826	366.4781	371.2637	354.9056	312.4774	258.7338	177.7651	106.2343	73.9455 (83)
Total gains	398.6944	465.3086	528.6278	590.1949	628.4768	615.9007	588.5044	551.7572	507.2983	444.2664	393.2564	376.2982 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	35.0983	35.1982	35.2966	35.7665	35.8558	36.2775	36.2775	36.3566	36.1139	35.8558	35.6756	35.4891
alpha	3.3399	3.3465	3.3531	3.3844	3.3904	3.4185	3.4185	3.4238	3.4076	3.3904	3.3784	3.3659
util living area	0.9700	0.9499	0.9110	0.8313	0.7059	0.5458	0.4111	0.4525	0.6670	0.8709	0.9521	0.9747 (86)
MIT	19.3677	19.6229	19.9953	20.4295	20.7492	20.9245	20.9782	20.9696	20.8469	20.4171	19.8162	19.3208 (87)
Th 2	20.0737	20.0761	20.0784	20.0894	20.0915	20.1011	20.1011	20.1029	20.0974	20.0915	20.0873	20.0830 (88)
util rest of house	0.9649	0.9417	0.8965	0.8045	0.6613	0.4813	0.3322	0.3715	0.6047	0.8440	0.9429	0.9704 (89)
MIT 2	17.8940	18.2618	18.7932	19.4024	19.8221	20.0364	20.0879	20.0833	19.9539	19.4010	18.5523	17.8322 (90)
Living area fraction	18.6917	18.9985	19.4439	19.9584	20.3239	20.5171	20.5698	20.5630	20.4373	19.9510	19.2365	18.6380 (92)
Temperature adjustment	18.5417	18.8485	19.2939	19.8084	20.1739	20.3671	20.4198	20.4130	20.2873	19.8010	19.0865	-0.1500
adjusted MIT												18.4880 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9540	0.9282	0.8820	0.7954	0.6656	0.5010	0.3607	0.4002	0.6186	0.8341	0.9301	0.9605 (94)
Ext temp.	380.3528	431.8978	466.2436	469.4156	418.3134	308.5769	212.2948	220.7874	313.7992	370.5814	365.7819	361.4405 (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	835.7163	816.1903	746.5387	628.1538	486.7537	327.4191	216.8628	227.3383	352.8657	528.5146	691.9949	829.1975 (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	338.7905	258.2445	208.5396	114.2915	50.9196	0.0000	0.0000	0.0000	0.0000	117.5023	234.8733	348.0112 (98)
												1671.1725 (98)
												28.8084 (99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													89.0000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1877.7220 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	338.7905	258.2445	208.5396	114.2915	50.9196	0.0000	0.0000	0.0000	0.0000	117.5023	234.8733	348.0112	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	380.6634	290.1624	234.3141	128.4175	57.2131	0.0000	0.0000	0.0000	0.0000	132.0250	263.9026	391.0238	(211)
Water heating requirement	0.0000	0.0000	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	175.1592	153.0061	159.1929	141.1961	136.7027	120.4001	115.3525	128.5910	130.0112	148.0436	158.0336	171.0458	(64)
Efficiency of water heater (217)m	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	(216)
Fuel for water heating, kWh/month	196.8081	171.9170	178.8685	158.6473	153.5986	135.2811	129.6096	144.4843	146.0800	166.3411	177.5659	192.1863	(219)
Water heating fuel used												1951.3877	(219)
Annual totals kWh/year													
Space heating fuel - main system												1877.7220	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												266.5405	(232)
Total delivered energy for all uses												4170.6502	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1877.7220	0.2160	405.5879 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1951.3877	0.2160	421.4997 (264)
Space and water heating			827.0877 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	266.5405	0.5190	138.3345 (268)
Total CO2, kg/year			1004.3472 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			17.3100 (273)

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

DER		17.3100	ZC1
Total Floor Area	TFA	58.0100	
Assumed number of occupants	N	1.9248	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.1514	ZC2
CO2 emissions from cooking, equation (L16)		2.8477	ZC3
Total CO2 emissions		37.3091	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		37.3091	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	58.0100 (1b)	x 2.4000 (2b)	= 139.2240 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	58.0100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 139.2240 (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) = 0.1437 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3937 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3346 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4266	0.4183	0.4099	0.3681	0.3597	0.3179	0.3179	0.3095	0.3346	0.3597	0.3764	0.3932 (22b)
Effective ac	0.5910	0.5875	0.5840	0.5677	0.5647	0.5505	0.5505	0.5479	0.5560	0.5647	0.5709	0.5773 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			1.8900	1.0000	1.8900			(26)				
TER Opening Type (Uw = 1.40)			11.4700	1.3258	15.2064			(27)				
External Wall	71.3000	11.4700	59.8300	0.1800	10.7694			(29a)				
Wall onto Stairwell	6.9400	1.8900	5.0500	0.1800	0.9090			(29a)				
Flat Roof to Stairwell	3.3100		3.3100	0.1300	0.4303			(30)				
Roof onto Roof Space	14.0400		14.0400	0.1300	1.8252			(30)				
Total net area of external elements Aum(A, m2)			95.5900					(31)				
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.0303			(33)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								9.1610 (36)				
Total fabric heat loss						(33) + (36) =		40.1913 (37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	27.1530	26.9906	26.8315	26.0840	25.9442	25.2932	25.2932	25.1726	25.5439	25.9442	26.2271	26.5229 (38)
Heat transfer coeff	67.3443	67.1820	67.0228	66.2754	66.1355	65.4845	65.4845	65.3639	65.7353	66.1355	66.4184	66.7142 (39)
Average = Sum(39)m / 12 =												66.2747 (39)
HLP	1.1609	1.1581	1.1554	1.1425	1.1401	1.1288	1.1288	1.1268	1.1332	1.1401	1.1449	1.1500 (40)
HLP (average)												1.1425 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.9248 (42)
Average daily hot water use (litres/day)												79.9151 (43)
Daily hot water use	87.9066	84.7100	81.5134	78.3168	75.1202	71.9236	71.9236	75.1202	78.3168	81.5134	84.7100	87.9066 (44)
Energy conte	130.3630	114.0163	117.6546	102.5741	98.4223	84.9310	78.7010	90.3106	91.3892	106.5053	116.2588	126.2496 (45)
Energy content (annual)										Total = Sum(45)m =		1257.3758 (45)
Distribution loss (46)m = 0.15 x (45)m	19.5544	17.1024	17.6482	15.3861	14.7633	12.7396	11.8052	13.5466	13.7084	15.9758	17.4388	18.9374 (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												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Combi 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 (57)
Total heat required for water heating calculated for each month	44.7962	38.9898	41.5383	38.6220	38.2804	35.4692	36.6515	38.2804	38.6220	41.5383	41.7748	44.7962 (61)
Solar input	175.1592	153.0061	159.1929	141.1961	136.7027	120.4001	115.3525	128.5910	130.0112	148.0436	158.0336	171.0458 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	175.1592	153.0061	159.1929	141.1961	136.7027	120.4001	115.3525	128.5910	130.0112	148.0436	158.0336	171.0458 (64)
	54.5448	47.6579	49.5047	43.7614	42.2955	37.1068	35.3310	39.5984	40.0424	45.7976	49.0998	53.1770 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	96.2423	96.2423	96.2423	96.2423	96.2423	96.2423	96.2423	96.2423	96.2423	96.2423	96.2423	96.2423	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	15.0926	13.4051	10.9018	8.2534	6.1695	5.2085	5.6280	7.3155	9.8188	12.4673	14.5512	15.5121	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	167.9017	169.6440	165.2535	155.9065	144.1078	133.0186	125.6103	123.8680	128.2585	137.6054	149.4042	160.4934	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.6242	32.6242	32.6242	32.6242	32.6242	32.6242	32.6242	32.6242	32.6242	32.6242	32.6242	32.6242	(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)	-76.9939	-76.9939	-76.9939	-76.9939	-76.9939	-76.9939	-76.9939	-76.9939	-76.9939	-76.9939	-76.9939	-76.9939	(71)
Water heating gains (Table 5)	73.3128	70.9194	66.5386	60.7797	56.8488	51.5373	47.4879	53.2236	55.6144	61.5559	68.1941	71.4745	(72)
Total internal gains	311.1798	308.8413	297.5666	279.8123	261.9988	244.6371	233.5988	239.2798	248.5645	266.5013	287.0222	302.3527	(73)

6. Solar gains

[Jan]			Area m2		Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
North			2.7000		10.6334		0.6300		0.7000		0.7700		8.7742 (74)
East			5.6200		19.6403		0.6300		0.7000		0.7700		33.7330 (76)
South			3.1500		46.7521		0.6300		0.7000		0.7700		45.0073 (78)
Solar gains	87.5146	156.4673	231.0612	310.3826	366.4781	371.2637	354.9056	312.4774	258.7338	177.7651	106.2343	73.9455	(83)
Total gains	398.6944	465.3086	528.6278	590.1949	628.4768	615.9007	588.5044	551.7572	507.2983	444.2664	393.2564	376.2982	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.8190	59.9636	60.1060	60.7839	60.9124	61.5180	61.5180	61.6314	61.2833	60.9124	60.6529	60.3840	
alpha	4.9879	4.9976	5.0071	5.0523	5.0608	5.1012	5.1012	5.1088	5.0856	5.0608	5.0435	5.0256	
util living area	0.9963	0.9915	0.9778	0.9335	0.8259	0.6467	0.4830	0.5335	0.7856	0.9583	0.9922	0.9972	(86)
MIT	19.8247	19.9973	20.2642	20.5931	20.8443	20.9662	20.9937	20.9897	20.9106	20.5749	20.1363	19.7930	(87)
Th 2	19.9514	19.9537	19.9559	19.9663	19.9682	19.9773	19.9773	19.9790	19.9738	19.9682	19.9643	19.9602	(88)
util rest of house	0.9951	0.9887	0.9703	0.9109	0.7720	0.5571	0.3742	0.4209	0.7051	0.9394	0.9891	0.9963	(89)
MIT 2	18.3959	18.6484	19.0345	19.5014	19.8218	19.9559	19.9751	19.9750	19.9063	19.4878	18.8596	18.3560	(90)
Living area fraction	19.1693	19.3786	19.7001	20.0923	20.3752	20.5028	20.5264	20.5243	20.4499	20.0763	19.5506	19.1338	(91)
MIT	19.1693	19.3786	19.7001	20.0923	20.3752	20.5028	20.5264	20.5243	20.4499	20.0763	19.5506	19.1338	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1693	19.3786	19.7001	20.0923	20.3752	20.5028	20.5264	20.5243	20.4499	20.0763	19.5506	19.1338	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9939	0.9868	0.9680	0.9141	0.7948	0.6045	0.4333	0.4821	0.7450	0.9417	0.9875	0.9953	(94)
Ext temp.	396.2569	459.1434	511.7149	539.4798	499.4921	372.3426	254.9875	265.9824	377.9318	418.3775	388.3451	374.5377	(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	1001.3623	972.6978	884.7099	741.7749	573.7416	386.5410	257.1207	269.5783	417.4132	626.7171	826.9518	996.2998	(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	450.1985	345.1086	277.5082	145.6525	55.2417	0.0000	0.0000	0.0000	0.0000	155.0047	315.7968	462.5910	(98)
Space heating per m2												2207.1019	(98)
												38.0469	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2363.0642 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	450.1985	345.1086	277.5082	145.6525	55.2417	0.0000	0.0000	0.0000	0.0000	155.0047	315.7968	462.5910	(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)	482.0112	369.4952	297.1180	155.9448	59.1453	0.0000	0.0000	0.0000	0.0000	165.9579	338.1122	495.2795	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	175.1592	153.0061	159.1929	141.1961	136.7027	120.4001	115.3525	128.5910	130.0112	148.0436	158.0336	171.0458	(64)
Efficiency of water heater (217)m	87.3236	87.0373	86.4368	85.1295	82.9678	80.3000	80.3000	80.3000	80.3000	85.1670	86.7604	80.3000	(216)
Fuel for water heating, kWh/month	200.5863	175.7938	184.1726	165.8605	164.7660	149.9379	143.6519	160.1383	161.9068	173.8275	182.1495	195.6342	(219)
Water heating fuel used												2058.4254	(219)
Annual totals kWh/year													
Space heating fuel - main system												2363.0642	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												266.5405	(232)
Total delivered energy for all uses												4763.0301	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2363.0642	0.2160	510.4219 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2058.4254	0.2160	444.6199 (264)
Space and water heating			955.0417 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	266.5405	0.5190	138.3345 (268)
Total CO2, kg/m2/year			1132.3013 (272)
Emissions per m2 for space and water heating			16.4634 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3847 (272b)
Emissions per m2 for pumps and fans			0.6710 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.4634 * 1.00) + 2.3847 + 0.6710, rounded to 2 d.p.			19.5200 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	0007-New-Build-Flat-3			Issued on Date	12/04/2022
Assessment Reference	Be Clean	Prop Type Ref	New Build Flat 3		
Property	New Build Flat 3, 233, London Road, East Reading, Reading, Berkshire, RG1 3NY				
SAP Rating	82 B	DER	21.23	TER	23.20
Environmental	88 B	% DER<TER	8.49		
CO ₂ Emissions (t/year)	0.75	DFEE	42.94	TFEE	57.72
General Requirements Compliance	Pass	% DFEE<TFEE	25.60		
Assessor Details	Mr. Andrew Taylor, Andrew Taylor, Tel: 01636 653 055, andy@mesbuildingsolutions.co.uk			Assessor ID	P741-0001
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 41 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) 23.20 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 21.23 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)57.7 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)42.9 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.11 (max. 0.30)	0.18 (max. 0.70)	OK
Floor	(no floor)		
Roof	0.10 (max. 0.20)	0.14 (max. 0.35)	OK
Openings	1.25 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.089

3 Air permeability

Air permeability at 50 pascals:	5.10 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from manufacturer
tbc tbc
Combi boiler
Efficiency: 89%
Minimum: 88% OK

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Time and temperature zone control 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): Slight OK
Based on:
Overshading: Average
Windows facing North: 1.35 m², No overhang
Windows facing East: 2.23 m², No overhang
Windows facing South: 1.89 m², No overhang
Air change rate: 6.00 ach
Blinds/curtains: None

10 Key features

External wall U-value	0.14 W/m ² K
External wall U-value	0.08 W/m ² K
Roof U-value	0.10 W/m ² K
Roof U-value	0.10 W/m ² K

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	40.6700 (1b)	x 2.2200 (2b)	= 90.2874 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	40.6700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 90.2874 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				2 * 10 =	20.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) = 0.2215 (8)
Pressure test					Yes
Measured/design AP50					5.1000
Infiltration rate					0.4765 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.4050 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.5164	0.5063	0.4962	0.4455	0.4354	0.3848	0.3848	0.3747	0.4050	0.4354	0.4557	0.4759 (22b)
Effective ac	0.6333	0.6282	0.6231	0.5993	0.5948	0.5740	0.5740	0.5702	0.5820	0.5948	0.6038	0.6132 (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
Window (Uw = 1.20)			3.5800	1.1450	4.0992		(27)
Glazed Door (Uw = 1.20)			1.8900	1.1450	2.1641		(27)
Door to Corridor			1.8900	1.4000	2.6460		(26)
External Wall	14.4300	3.2400	11.1900	0.1500	1.6785	60.0000	671.4000 (29a)
Wall onto Stairwell	16.3700	1.8900	14.4800	0.1342	1.9429	9.0000	130.3200 (29a)
Wall onto Roofspace	28.8200		28.8200	0.0800	2.3056	18.0000	518.7600 (29a)
Dormer Cheeks	3.8100	2.2300	1.5800	0.1800	0.2844	18.0000	28.4400 (29a)
Dormer Roof	1.8500		1.8500	0.1400	0.2590	9.0000	16.6500 (30)
Main Plane Roof	14.0400		14.0400	0.0952	1.3371	9.0000	126.3600 (30)
External Sloped Roof	21.6800		21.6800	0.1000	2.1680	9.0000	195.1200 (30)
Total net area of external elements Aum(A, m ²)			101.0000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		18.8849		(33)
Party Floor			40.6700			30.0000	1220.1000 (32d)
Party Ceiling			40.6700			30.0000	1220.1000 (32b)
Stud			43.8700			9.0000	394.8300 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		4522.0800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							111.1896 (35)
Thermal bridges (User defined value 0.089 * total exposed area)							8.9890 (36)
Total fabric heat loss						(33) + (36) =	27.8739 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	18.8705	18.7162	18.5650	17.8547	17.7218	17.1031	17.1031	16.9886	17.3414	17.7218	17.9906	18.2717 (38)
Heat transfer coeff	46.7443	46.5901	46.4388	45.7285	45.5957	44.9770	44.9770	44.8625	45.2153	45.5957	45.8645	46.1456 (39)
Average = Sum(39)m / 12 =												45.7279 (39)
HLP	1.1494	1.1456	1.1418	1.1244	1.1211	1.1059	1.1059	1.1031	1.1118	1.1211	1.1277	1.1346 (40)
HLP (average)												1.1244 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4243 (42)
Average daily hot water use (litres/day)												68.0261 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	74.8287	72.1076	69.3866	66.6655	63.9445	61.2235	61.2235	63.9445	66.6655	69.3866	72.1076	74.8287 (44)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy conte	110.9688	97.0540	100.1510	87.3141	83.7799	72.2957	66.9926	76.8750	77.7931	90.6604	98.9629	107.4673 (45)
Energy content (annual)										Total =	Sum (45)m =	1070.3149 (45)
Distribution loss (46)m = 0.15 x (45)m	16.6453	14.5581	15.0227	13.0971	12.5670	10.8444	10.0489	11.5313	11.6690	13.5991	14.8444	16.1201 (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	38.1319	33.1893	35.3586	32.8762	32.5854	30.1924	31.1988	32.5854	32.8762	35.3586	35.5599	38.1319 (61)
Total heat required for water heating calculated for each month	149.1006	130.2432	135.5097	120.1902	116.3654	102.4881	98.1914	109.4604	110.6693	126.0190	134.5228	145.5992 (62)
Solar input	0.0000	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	149.1006	130.2432	135.5097	120.1902	116.3654	102.4881	98.1914	109.4604	110.6693	126.0190	134.5228	145.5992 (64)
Heat gains from water heating, kWh/month	46.4301	40.5678	42.1399	37.2510	36.0032	31.5864	30.0747	33.7073	34.0853	38.9842	41.7952	45.2659 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	71.2128	71.2128	71.2128	71.2128	71.2128	71.2128	71.2128	71.2128	71.2128	71.2128	71.2128	71.2128 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	11.8892	10.5599	8.5879	6.5016	4.8600	4.1030	4.4335	5.7628	7.7348	9.8211	11.4626	12.2196 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	123.2221	124.5008	121.2786	114.4189	105.7599	97.6216	92.1847	90.9060	94.1282	100.9879	109.6469	117.7852 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.1213	30.1213	30.1213	30.1213	30.1213	30.1213	30.1213	30.1213	30.1213	30.1213	30.1213	30.1213 (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)	-56.9702	-56.9702	-56.9702	-56.9702	-56.9702	-56.9702	-56.9702	-56.9702	-56.9702	-56.9702	-56.9702	-56.9702 (71)
Water heating gains (Table 5)	62.4060	60.3687	56.6396	51.7375	48.3914	43.8700	40.4230	45.3055	47.3406	52.3982	58.0488	60.8412 (72)
Total internal gains	244.8812	242.7932	233.8699	220.0218	206.3751	192.9585	184.4050	189.3381	196.5675	210.5709	226.5222	238.2099 (73)

6. Solar gains

[Jan]			Area m2		Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
North			1.3500		10.6334		0.6300		0.7000		0.7700		4.3871 (74)
East			2.2300		19.6403		0.6300		0.7000		0.7700		13.3852 (76)
South			1.8900		46.7521		0.6300		0.7000		0.7700		27.0044 (78)
Solar gains	44.7767	78.7944	113.7045	149.4462	174.2511	175.7531	168.3141	149.5549	126.1311	88.7520	54.1112	37.9989	(83)
Total gains	289.6578	321.5876	347.5744	369.4680	380.6262	368.7115	352.7191	338.8930	322.6986	299.3229	280.6334	276.2088	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	26.8724	26.9614	27.0492	27.4693	27.5494	27.9283	27.9283	27.9997	27.7812	27.5494	27.3879	27.2211
alpha	2.7915	2.7974	2.8033	2.8313	2.8366	2.8619	2.8619	2.8666	2.8521	2.8366	2.8259	2.8147
util living area	0.9595	0.9443	0.9175	0.8655	0.7779	0.6438	0.5083	0.5416	0.7278	0.8794	0.9424	0.9641 (86)
MIT	18.9306	19.1600	19.5373	20.0307	20.4683	20.7892	20.9223	20.9046	20.6785	20.1234	19.4534	18.8947 (87)
Th 2	19.9607	19.9638	19.9668	19.9810	19.9836	19.9960	19.9960	19.9983	19.9912	19.9836	19.9783	19.9726 (88)
util rest of house	0.9532	0.9356	0.9041	0.8422	0.7365	0.5734	0.4097	0.4448	0.6659	0.8538	0.9320	0.9584 (89)
MIT 2	17.2116	17.5434	18.0863	18.7923	19.3911	19.8047	19.9458	19.9329	19.6769	18.9353	17.9798	17.1668 (90)
Living area fraction									fLA =	Living area / (4) =		0.5461 (91)
MIT	18.1503	18.4262	18.8787	19.4686	19.9794	20.3423	20.4790	20.4635	20.2239	19.5841	18.7846	18.1104 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.0003	18.2762	18.7287	19.3186	19.8294	20.1923	20.3290	20.3135	20.0739	19.4341	18.6346	17.9604 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9371	0.9173	0.8841	0.8244	0.7295	0.5881	0.4440	0.4769	0.6715	0.8372	0.9141	0.9434 (94)
Ext temp.	271.4380	294.9764	307.2986	304.5971	277.6563	216.8557	156.6107	161.6308	216.6807	250.6077	256.5376	260.5690 (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	640.4129	623.1981	567.8853	476.4267	370.6645	251.5258	167.7208	175.5708	270.1110	402.7975	529.0276	634.9824 (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	274.5173	220.5650	193.8765	123.7173	69.1981	0.0000	0.0000	0.0000	0.0000	113.2292	196.1928	278.5636 (98)
Space heating per m ²										(98) / (4) =		36.1411 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													89.0000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1651.5278 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	274.5173	220.5650	193.8765	123.7173	69.1981	0.0000	0.0000	0.0000	0.0000	113.2292	196.1928	278.5636	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	308.4464	247.8258	217.8388	139.0082	77.7506	0.0000	0.0000	0.0000	0.0000	127.2238	220.4413	312.9928	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	149.1006	130.2432	135.5097	120.1902	116.3654	102.4881	98.1914	109.4604	110.6693	126.0190	134.5228	145.5992	(64)
Efficiency of water heater (217)m	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	(216)
Fuel for water heating, kWh/month	167.5288	146.3407	152.2580	135.0452	130.7476	115.1552	110.3274	122.9892	124.3475	141.5944	151.1493	163.5946	(219)
Water heating fuel used												1661.0780	(219)
Annual totals kWh/year													
Space heating fuel - main system												1651.5278	(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)												209.9668	(232)
Total delivered energy for all uses												3597.5727	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1651.5278	0.2160	356.7300	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1661.0780	0.2160	358.7929	(264)
Space and water heating			715.5229	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	209.9668	0.5190	108.9728	(268)
Total CO2, kg/year			863.4206	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			21.2300	(273)

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

DER			21.2300	ZC1
Total Floor Area		TFA	40.6700	
Assumed number of occupants		N	1.4243	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			17.9540	ZC2
CO2 emissions from cooking, equation (L16)			3.7665	ZC3
Total CO2 emissions			42.9504	ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year			0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000	ZC7
Net CO2 emissions			42.9504	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	40.6700 (1b)	x 2.2200 (2b)	= 90.2874 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	40.6700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 90.2874 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
					Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					20.0000 / (5) = 0.2215 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4715 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.4008 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
	0.5110	0.5010	0.4910	0.4409	0.4308	0.3807	0.3807	0.3707	0.4008	0.4308	0.4509	0.4709 (22b)
Effective ac	0.6306	0.6255	0.6205	0.5972	0.5928	0.5725	0.5725	0.5687	0.5803	0.5928	0.6016	0.6109 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			5.4700	1.3258	7.2519		(27)
External Wall	14.4300	3.2400	11.1900	0.1800	2.0142		(29a)
Wall onto Stairwell	16.3700	1.8900	14.4800	0.1800	2.6064		(29a)
Wall onto Roofspace	28.8200		28.8200	0.1800	5.1876		(29a)
Dormer Cheeks	3.8100	2.2300	1.5800	0.1800	0.2844		(29a)
Dormer Roof	1.8500		1.8500	0.1300	0.2405		(30)
Main Plane Roof	14.0400		14.0400	0.1300	1.8252		(30)
External Sloped Roof	21.6800		21.6800	0.1300	2.8184		(30)
Total net area of external elements Aum(A, m ²)			101.0000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	24.1186		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.1129 (36)
Total fabric heat loss						(33) + (36) =	32.2315 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	18.7875	18.6365	18.4884	17.7929	17.6628	17.0571	17.0571	16.9449	17.2904	17.6628	17.9260	18.2012 (38)
Heat transfer coeff	51.0190	50.8680	50.7199	50.0244	49.8943	49.2886	49.2886	49.1764	49.5219	49.8943	50.1575	50.4327 (39)
Average = Sum(39)m / 12 =												50.0238 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2545	1.2507	1.2471	1.2300	1.2268	1.2119	1.2119	1.2092	1.2177	1.2268	1.2333	1.2400 (40)
HLP (average)												1.2300 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4243 (42)
Average daily hot water use (litres/day)												68.0261 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	74.8287	72.1076	69.3866	66.6655	63.9445	61.2235	61.2235	63.9445	66.6655	69.3866	72.1076	74.8287 (44)
Energy conte	110.9688	97.0540	100.1510	87.3141	83.7799	72.2957	66.9926	76.8750	77.7931	90.6604	98.9629	107.4673 (45)
Energy content (annual)												
Distribution loss (46)m = 0.15 x (45)m												
	16.6453	14.5581	15.0227	13.0971	12.5670	10.8444	10.0489	11.5313	11.6690	13.5991	14.8444	16.1201 (46)
Water storage loss:												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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	38.1319	33.1893	35.3586	32.8762	32.5854	30.1924	31.1988	32.5854	32.8762	35.3586	35.5599	38.1319	(61)
Total heat required for water heating calculated for each month	149.1006	130.2432	135.5097	120.1902	116.3654	102.4881	98.1914	109.4604	110.6693	126.0190	134.5228	145.5992	(62)
Solar input	0.0000	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	149.1006	130.2432	135.5097	120.1902	116.3654	102.4881	98.1914	109.4604	110.6693	126.0190	134.5228	145.5992	(64)
Heat gains from water heating, kWh/month	46.4301	40.5678	42.1399	37.2510	36.0032	31.5864	30.0747	33.7073	34.0853	38.9842	41.7952	45.2659	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	71.2128	71.2128	71.2128	71.2128	71.2128	71.2128	71.2128	71.2128	71.2128	71.2128	71.2128	71.2128	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	11.8892	10.5599	8.5879	6.5016	4.8600	4.1030	4.4335	5.7628	7.7348	9.8211	11.4626	12.2196	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	123.2221	124.5008	121.2786	114.4189	105.7599	97.6216	92.1847	90.9060	94.1282	100.9879	109.6469	117.7852	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.1213	30.1213	30.1213	30.1213	30.1213	30.1213	30.1213	30.1213	30.1213	30.1213	30.1213	30.1213	(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)	-56.9702	-56.9702	-56.9702	-56.9702	-56.9702	-56.9702	-56.9702	-56.9702	-56.9702	-56.9702	-56.9702	-56.9702	(71)
Water heating gains (Table 5)	62.4060	60.3687	56.6396	51.7375	48.3914	43.8700	40.4230	45.3055	47.3406	52.3982	58.0488	60.8412	(72)
Total internal gains	244.8812	242.7932	233.8699	220.0218	206.3751	192.9585	184.4050	189.3381	196.5675	210.5709	226.5222	238.2099	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
North					1.3500	10.6334	0.6300	0.7000	0.7700		4.3871 (74)	
East					2.2300	19.6403	0.6300	0.7000	0.7700		13.3852 (76)	
South					1.8900	46.7521	0.6300	0.7000	0.7700		27.0044 (78)	
Solar gains	44.7767	78.7944	113.7045	149.4462	174.2511	175.7531	168.3141	149.5549	126.1311	88.7520	54.1112	37.9989 (83)
Total gains	289.6578	321.5876	347.5744	369.4680	380.6262	368.7115	352.7191	338.8930	322.6986	299.3229	280.6334	276.2088 (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	55.3579	55.5223	55.6844	56.4585	56.6058	57.3014	57.3014	57.4321	57.0314	56.6058	56.3087	56.0014		
alpha	4.6905	4.7015	4.7123	4.7639	4.7737	4.8201	4.8201	4.8288	4.8021	4.7737	4.7539	4.7334		
util living area	0.9958	0.9925	0.9844	0.9606	0.8976	0.7579	0.5907	0.6327	0.8504	0.9681	0.9921	0.9966	(86)	
MIT	19.7229	19.8666	20.1076	20.4301	20.7213	20.9178	20.9806	20.9730	20.8466	20.4782	20.0474	19.7005	(87)	
Th 2	19.8767	19.8796	19.8825	19.8961	19.8986	19.9105	19.9105	19.9127	19.9059	19.8986	19.8935	19.8881	(88)	
util rest of house	0.9944	0.9899	0.9787	0.9452	0.8552	0.6642	0.4565	0.4999	0.7767	0.9524	0.9889	0.9955	(89)	
MIT 2	18.1950	18.4062	18.7572	19.2265	19.6199	19.8541	19.9033	19.9015	19.7827	19.3020	18.6802	18.1703	(90)	
Living area fraction	19.0294	19.2037	19.4947	19.8838	20.2214	20.4350	20.4916	20.4867	20.3637	19.9443	19.4268	19.0059	(92)	
Temperature adjustment	19.0294	19.2037	19.4947	19.8838	20.2214	20.4350	20.4916	20.4867	20.3637	19.9443	19.4268	19.0059	(92)	
adjusted MIT	19.0294	19.2037	19.4947	19.8838	20.2214	20.4350	20.4916	20.4867	20.3637	19.9443	19.4268	19.0059	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains	287.6145	317.6884	339.3058	349.1310	330.8313	262.6105	187.0290	194.0811	261.6721	285.3186	277.0090	274.6323	(94)	
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)	
Heat loss rate W	751.4786	727.6018	659.0875	549.4577	425.1679	287.5984	191.8104	200.9683	310.1884	466.2276	618.2819	746.7036	(97)	
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(97a)	
Space heating kWh	345.1149	275.4618	237.9176	144.2352	70.1865	0.0000	0.0000	0.0000	0.0000	134.5963	245.7165	351.2210	(98)	
Space heating												1804.4499	(98)	
Space heating per m2												44.3681	(99)	

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1931.9592 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	345.1149	275.4618	237.9176	144.2352	70.1865	0.0000	0.0000	0.0000	0.0000	134.5963	245.7165	351.2210	(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)	369.5020	294.9270	254.7298	154.4274	75.1461	0.0000	0.0000	0.0000	0.0000	144.1074	263.0798	376.0397	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	149.1006	130.2432	135.5097	120.1902	116.3654	102.4881	98.1914	109.4604	110.6693	126.0190	134.5228	145.5992	(64)
Efficiency of water heater (217)m	87.0951	86.8915	86.4540	85.5113	83.8235	80.3000	80.3000	80.3000	80.3000	85.2171	86.5487	87.1862	(216)
Fuel for water heating, kWh/month	171.1930	149.8919	156.7419	140.5548	138.8219	127.6315	122.2807	136.3143	137.8198	147.8799	155.4302	166.9979	(219)
Water heating fuel used												1751.5579	(219)
Annual totals kWh/year													
Space heating fuel - main system												1931.9592	(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)												209.9668	(232)
Total delivered energy for all uses												3968.4839	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1931.9592	0.2160	417.3032 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1751.5579	0.2160	378.3365 (264)
Space and water heating			795.6397 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	209.9668	0.5190	108.9728 (268)
Total CO2, kg/m2/year			943.5375 (272)
Emissions per m2 for space and water heating			19.5633 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.6794 (272b)
Emissions per m2 for pumps and fans			0.9571 (272c)
Target Carbon Dioxide Emission Rate (TER) = (19.5633 * 1.00) + 2.6794 + 0.9571, rounded to 2 d.p.			23.2000 (273)

Appendix B

SAP Calculations for 'Be Lean, Be Clean & Be Green'



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FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	0007-Conversion-Flat-1			Issued on Date	12/04/2022
Assessment Reference	Be Green	Prop Type Ref	Conversion Flat 1		
Property	Conversion Flat 1, 233, London Road, East Reading, Reading, Berkshire, RG1 3NY				
SAP Rating	73 C	DER	37.19	TER	34.49
Environmental	75 C	% DER<TER	-7.81		
CO ₂ Emissions (t/year)	1.54	DFEE	95.99	TFEE	68.70
General Requirements Compliance	Fail	% DFEE<TFEE	-39.72		
Assessor Details	Mr. Andrew Taylor, Andrew Taylor, Tel: 01636 653 055, andy@mesbuildingsolutions.co.uk			Assessor ID	P741-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

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

DWELLING AS DESIGNED

Ground-floor flat, total floor area 52 m²

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

1a TER and DER

Fuel for main heating:Electricity
Fuel factor:1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 34.49 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 37.19 kgCO₂/m²Fail
Excess emissions =2.70 kgCO₂/m² (7.8%)

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)68.7 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)96.0 kWh/m²/yrFail
Excess energy =27.3 kWh/m²/yr (39.7%)

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.20 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.16 (max. 0.25)	0.16 (max. 0.70)	OK
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	OK
Openings	1.46 (max. 2.00)	1.80 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using default y-value of 0.15

3 Air permeability

Air permeability at 50 pascals: 15.00 (assumed) OK

4 Heating efficiency

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

Secondary heating system: None

5 Cylinder insulation

Hot water storage: No cylinder

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls: No cylinder

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames Valley): Not significant OK
Based on:
Overshading: Average
Windows facing North: 7.65 m², No overhang
Windows facing East: 3.83 m², No overhang
Air change rate: 8.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.11 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	27.1100 (1b)	x 2.8000 (2b)	= 75.9080 (1b) - (3b)
First floor	25.0700 (1c)	x 2.8600 (2c)	= 71.7002 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.1800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 147.6082 (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) = 0.2032 (8)
Pressure test					No
Measured/design AP50					15.0000
Infiltration rate					0.9532 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.8103 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	1.0331	1.0128	0.9926	0.8913	0.8710	0.7697	0.7697	0.7495	0.8103	0.8710	0.9115	0.9520 (22b)
Effective ac	1.0331	1.0128	0.9926	0.8972	0.8793	0.7963	0.7963	0.7809	0.8283	0.8793	0.9154	0.9532 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.40)			11.4800	1.3258	15.2197		(27)
Door			1.8900	1.8000	3.4020		(26)
REFURB - Ground Floor			27.1100	0.1600	4.3376	110.0000	2982.1000 (28a)
REFURB - External Wall	63.7500	13.3700	50.3800	0.2000	10.0760	190.0000	9572.2000 (29a)
REFURB - Wall onto Commercial	16.7200		16.7200	0.1000	1.6720	190.0000	3176.8000 (29a)
REFURB - Wall onto Stairwell	9.8700		9.8700	0.2000	1.9740	18.0000	177.6600 (29a)
REFURB - Plane Roof	25.0700		25.0700	0.1100	2.7577	9.0000	225.6300 (30)
Total net area of external elements Aum(A, m ²)			142.5200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		39.4390		(33)
Party Wall 1			30.8400	0.0000	0.0000	45.0000	1387.8000 (32)
Party Ceilings 1			2.0400			30.0000	61.2000 (32b)
GF Stud			16.8000			9.0000	151.2000 (32c)
FF Stud			51.0200			9.0000	459.1800 (32c)
Internal Floor			25.0700			18.0000	451.2600 (32d)
Internal Ceiling 1			25.0700			18.0000	451.2600 (32e)
Heat capacity Cm = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =				19096.2900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							365.9695 (35)
Thermal bridges (Default value 0.150 * total exposed area)							21.3780 (36)
Total fabric heat loss						(33) + (36) =	60.8170 (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	50.3218	49.3351	48.3497	43.7028	42.8333	38.7860	38.7860	38.0365	40.3449	42.8333	44.5922	46.4310 (38)
Heat transfer coeff	111.1388	110.1521	109.1667	104.5198	103.6503	99.6030	99.6030	98.8534	101.1619	103.6503	105.4092	107.2480 (39)
Average = Sum(39)m / 12 =												104.5130 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	2.1299	2.1110	2.0921	2.0031	1.9864	1.9088	1.9088	1.8945	1.9387	1.9864	2.0201	2.0553 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.7544 (42)
Average daily hot water use (litres/day)	75.8665 (43)

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy conte	83.4532	80.4185	77.3839	74.3492	71.3146	68.2799	68.2799	71.3146	74.3492	77.3839	80.4185	83.4532 (44)
Energy content (annual)	123.7587	108.2401	111.6941	97.3776	93.4362	80.6283	74.7140	85.7354	86.7593	101.1096	110.3691	119.8537 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum (45)m =		1193.6762 (45)
18.5638	16.2360	16.7541	14.6066	14.0154	12.0942	11.2071	12.8603	13.0139	15.1664	16.5554	17.9781	(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	(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	(57)
Total heat required for water heating calculated for each month	123.7587	108.2401	111.6941	97.3776	93.4362	80.6283	74.7140	85.7354	86.7593	101.1096	110.3691	119.8537 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Output from w/h	123.7587	108.2401	111.6941	97.3776	93.4362	80.6283	74.7140	85.7354	86.7593	101.1096	110.3691	119.8537 (64)
Heat gains from water heating, kWh/month	41.1498	35.9898	37.1383	32.3781	31.0675	26.8089	24.8424	28.5070	28.8475	33.6190	36.6977	39.8513 (65)
										Total per year (kWh/year) = Sum (64)m =		1193.6762 (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	87.7191	87.7191	87.7191	87.7191	87.7191	87.7191	87.7191	87.7191	87.7191	87.7191	87.7191	87.7191	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.6352	12.1106	9.8490	7.4564	5.5737	4.7056	5.0845	6.6091	8.8707	11.2634	13.1460	14.0141	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	152.8928	154.4793	150.4813	141.9699	131.2258	121.1279	114.3818	112.7953	116.7933	125.3047	136.0488	146.1467	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.7719	31.7719	31.7719	31.7719	31.7719	31.7719	31.7719	31.7719	31.7719	31.7719	31.7719	31.7719	(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)	-70.1752	-70.1752	-70.1752	-70.1752	-70.1752	-70.1752	-70.1752	-70.1752	-70.1752	-70.1752	-70.1752	-70.1752	(71)
Water heating gains (Table 5)	55.3088	53.5563	49.9171	44.9695	41.7574	37.2346	33.3903	38.3159	40.0659	45.1868	50.9691	53.5636	(72)
Total internal gains	274.1525	272.4620	262.5631	246.7115	230.8726	215.3837	205.1724	210.0359	218.0457	234.0706	252.4796	266.0402	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W
North					7.6500	10.6334	0.6300	0.7000			0.7700	24.8602 (74)
East					3.8300	19.6403	0.6300	0.7000			0.7700	22.9889 (76)
Solar gains	47.8491	92.4803	154.7907	237.6862	307.0556	322.5101	303.5995	249.3322	183.1993	109.9155	59.3327	39.6297 (83)
Total gains	322.0016	364.9423	417.3538	484.3977	537.9282	537.8939	508.7719	459.3682	401.2450	343.9861	311.8123	305.6699 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	47.7288	48.1564	48.5910	50.7514	51.1771	53.2567	53.2567	53.6605	52.4360	51.1771	50.3232	49.4604	
alpha	4.1819	4.2104	4.2394	4.3834	4.4118	4.5504	4.5504	4.5774	4.4957	4.4118	4.3549	4.2974	
util living area	0.9995	0.9990	0.9974	0.9908	0.9648	0.8819	0.7539	0.8165	0.9630	0.9956	0.9991	0.9996	(86)
MIT	19.2130	19.3553	19.6350	20.0720	20.4728	20.8049	20.9346	20.9046	20.6286	20.1285	19.6386	19.2417	(87)
Th 2	19.2481	19.2604	19.2726	19.3313	19.3424	19.3948	19.3948	19.4046	19.3745	19.3424	19.3200	19.2967	(88)
util rest of house	0.9992	0.9984	0.9958	0.9839	0.9336	0.7679	0.5306	0.6125	0.9130	0.9913	0.9984	0.9994	(89)
MIT 2	16.9628	17.1787	17.5954	18.2685	18.8393	19.2818	19.3801	19.3772	19.0826	18.3617	17.6317	17.0358	(90)
Living area fraction	17.9805	18.1631	18.5179	19.0842	19.5781	19.9707	20.0832	20.0680	19.7818	19.1608	18.5394	18.0335	(91)
MIT	17.9805	18.1631	18.5179	19.0842	19.5781	19.9707	20.0832	20.0680	19.7818	19.1608	18.5394	18.0335	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.9805	18.1631	18.5179	19.0842	19.5781	19.9707	20.0832	20.0680	19.7818	19.1608	18.5394	18.0335	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	321.6165	364.1456	415.1328	475.9047	505.4212	439.7641	324.9841	327.2912	373.2942	340.7467	311.1722	305.3964	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1520.4329	1460.9599	1311.9510	1064.4488	816.5680	534.9360	346.9321	362.5935	574.7855	887.3281	1205.8158	1483.6136	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	891.9194	737.0592	667.2327	423.7518	231.4932	0.0000	0.0000	0.0000	0.0000	406.6566	644.1434	876.5936	(98)
Space heating												4878.8500	(98)
Space heating per m2												93.5004	(99)

Regs Region: England

Elmhurst Energy Systems
SAP2012 Calculator (Design
System) version 4.14r10

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													175.1000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													2786.3221	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	891.9194	737.0592	667.2327	423.7518	231.4932	0.0000	0.0000	0.0000	0.0000	406.6566	644.1434	876.5936	(98)	
Space heating efficiency (main heating system 1)	175.1000	175.1000	175.1000	175.1000	175.1000	0.0000	0.0000	0.0000	0.0000	175.1000	175.1000	175.1000	(210)	
Space heating fuel (main heating system)	509.3772	420.9362	381.0581	242.0056	132.2063	0.0000	0.0000	0.0000	0.0000	232.2425	367.8717	500.6246	(211)	
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)	
Water heating requirement	123.7587	108.2401	111.6941	97.3776	93.4362	80.6283	74.7140	85.7354	86.7593	101.1096	110.3691	119.8537	(64)	
Efficiency of water heater (217)m	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	(216)	
Fuel for water heating, kWh/month	70.6789	61.8162	63.7888	55.6126	53.3616	46.0470	42.6693	48.9637	49.5485	57.7439	63.0320	68.4487	(219)	
Water heating fuel used													(219)	
Annual totals kWh/year														
Space heating fuel - main system													2786.3221	(211)
Space heating fuel - secondary													0.0000	(215)
Electricity for pumps and fans:														
central heating pump													30.0000	(230c)
Total electricity for the above, kWh/year													30.0000	(231)
Electricity for lighting (calculated in Appendix L)													240.8015	(232)
Total delivered energy for all uses													3738.8348	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2786.3221	0.5190	1446.1012 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	681.7112	0.5190	353.8081 (264)
Space and water heating			1799.9093 (265)
Pumps and fans	30.0000	0.5190	15.5700 (267)
Energy for lighting	240.8015	0.5190	124.9760 (268)
Total CO2, kg/year			1940.4553 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			37.1900 (273)

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

DER			37.1900	ZC1
Total Floor Area		TFA	52.1800	
Assumed number of occupants		N	1.7544	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			17.3632	ZC2
CO2 emissions from cooking, equation (L16)			3.0875	ZC3
Total CO2 emissions			57.6407	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			57.6407	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	27.1100 (1b)	x 2.8000 (2b)	= 75.9080 (1b) - (3b)
First floor	25.0700 (1c)	x 2.8600 (2c)	= 71.7002 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.1800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 147.6082 (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) = 0.1355 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3855 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3277 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4178	0.4096	0.4014	0.3604	0.3522	0.3113	0.3113	0.3031	0.3277	0.3522	0.3686	0.3850 (22b)
Effective ac	0.5873	0.5839	0.5806	0.5650	0.5620	0.5484	0.5484	0.5459	0.5537	0.5620	0.5679	0.5741 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			11.1500	1.3258	14.7822		(27)
REFURB - Ground Floor			27.1100	0.1300	3.5243		(28a)
REFURB - External Wall	63.7500	13.0400	50.7100	0.1800	9.1278		(29a)
REFURB - Wall onto Commercial	16.7200		16.7200	0.1800	3.0096		(29a)
REFURB - Wall onto Stairwell	9.8700		9.8700	0.1800	1.7766		(29a)
REFURB - Plane Roof	25.0700		25.0700	0.1300	3.2591		(30)
Total net area of external elements Aum(A, m ²)			142.5200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		37.3696		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (User defined value 0.050 * total exposed area)							7.1260 (36)
Total fabric heat loss						(33) + (36) =	44.4956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	28.6063	28.4412	28.2794	27.5195	27.3773	26.7154	26.7154	26.5928	26.9703	27.3773	27.6649	27.9656 (38)
Heat transfer coeff	73.1019	72.9368	72.7750	72.0151	71.8729	71.2110	71.2110	71.0884	71.4659	71.8729	72.1605	72.4612 (39)
Average = Sum(39)m / 12 =												72.0144 (39)
HLP	1.4010	1.3978	1.3947	1.3801	1.3774	1.3647	1.3647	1.3624	1.3696	1.3774	1.3829	1.3887 (40)
HLP (average)												1.3801 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7544 (42)
Average daily hot water use (litres/day)												75.8665 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	83.4532	80.4185	77.3839	74.3492	71.3146	68.2799	68.2799	71.3146	74.3492	77.3839	80.4185	83.4532 (44)
Energy conte	123.7587	108.2401	111.6941	97.3776	93.4362	80.6283	74.7140	85.7354	86.7593	101.1096	110.3691	119.8537 (45)
Energy content (annual)												1193.6762 (45)
Distribution loss (46)m = 0.15 x (45)m												
	18.5638	16.2360	16.7541	14.6066	14.0154	12.0942	11.2071	12.8603	13.0139	15.1664	16.5554	17.9781 (46)
Water storage loss:												
Store volume												150.0000 (47)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

a) If manufacturer declared loss factor is known (kWh/day):													1.3938 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.7527 (55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month	170.3536	150.3259	158.2890	142.4695	140.0311	125.7202	121.3089	132.3303	131.8512	147.7046	155.4609	166.4486	(62)
Solar input	0.0000	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	170.3536	150.3259	158.2890	142.4695	140.0311	125.7202	121.3089	132.3303	131.8512	147.7046	155.4609	166.4486	(64)
Heat gains from water heating, kWh/month	78.4257	69.6584	74.4142	68.4515	68.3434	62.8824	62.1183	65.7829	64.9210	70.8949	72.7712	77.1273	(65)
Solar input (sum of months) = Sum(63)m =													0.0000 (63)
Total per year (kWh/year) = Sum(64)m =													1742.2936 (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	87.7191	87.7191	87.7191	87.7191	87.7191	87.7191	87.7191	87.7191	87.7191	87.7191	87.7191	87.7191	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.6528	12.1263	9.8618	7.4660	5.5809	4.7117	5.0911	6.6176	8.8821	11.2779	13.1630	14.0323	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	152.8928	154.4793	150.4813	141.9699	131.2258	121.1279	114.3818	112.7953	116.7933	125.3047	136.0488	146.1467	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.7719	31.7719	31.7719	31.7719	31.7719	31.7719	31.7719	31.7719	31.7719	31.7719	31.7719	31.7719	(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)	-70.1752	-70.1752	-70.1752	-70.1752	-70.1752	-70.1752	-70.1752	-70.1752	-70.1752	-70.1752	-70.1752	-70.1752	(71)
Water heating gains (Table 5)	105.4109	103.6584	100.0191	95.0716	91.8595	87.3366	83.4924	88.4179	90.1680	95.2888	101.0711	103.6657	(72)
Total internal gains	324.2722	322.5797	312.6779	296.8232	280.9819	265.4919	255.2810	260.1465	268.1592	284.1872	302.5986	316.1604	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W
North					7.4300	10.6334	0.6300	0.7000			0.7700	24.1453
East					3.7200	19.6403	0.6300	0.7000			0.7700	22.3286 (76)

Solar gains	46.4739	89.8224	150.3420	230.8548	298.2302	313.2404	294.8734	242.1661	177.9341	106.7565	57.6275	38.4907 (83)
Total gains	370.7461	412.4021	463.0199	527.6780	579.2121	578.7323	550.1545	502.3126	446.0933	390.9437	360.2261	354.6511 (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	49.5693	49.6815	49.7919	50.3174	50.4169	50.8856	50.8856	50.9733	50.7040	50.4169	50.2160	50.0076	
alpha	4.3046	4.3121	4.3195	4.3545	4.3611	4.3924	4.3924	4.3982	4.3803	4.3611	4.3477	4.3338	
util living area	0.9959	0.9929	0.9838	0.9524	0.8667	0.7066	0.5478	0.6128	0.8525	0.9709	0.9925	0.9966	(86)
MIT	19.5343	19.6829	19.9667	20.3628	20.7124	20.9189	20.9793	20.9668	20.8047	20.3641	19.8855	19.5099	(87)
Th 2	19.7626	19.7650	19.7674	19.7786	19.7807	19.7905	19.7905	19.7923	19.7867	19.7807	19.7765	19.7720	(88)
util rest of house	0.9944	0.9904	0.9778	0.9336	0.8146	0.6033	0.4079	0.4700	0.7743	0.9558	0.9894	0.9954	(89)
MIT 2	17.8425	18.0605	18.4733	19.0429	19.5049	19.7386	19.7835	19.7794	19.6322	19.0563	18.3645	17.8133	(90)
Living area fraction	18.6077	18.7943	19.1487	19.6399	20.0510	20.2724	20.3243	20.3165	20.1625	19.6478	19.0524	18.5806	(91)
MIT	18.6077	18.7943	19.1487	19.6399	20.0510	20.2724	20.3243	20.3165	20.1625	19.6478	19.0524	18.5806	(92)
Temperature adjustment	18.6077	18.7943	19.1487	19.6399	20.0510	20.2724	20.3243	20.3165	20.1625	19.6478	19.0524	18.5806	(93)
adjusted MIT	18.6077	18.7943	19.1487	19.6399	20.0510	20.2724	20.3243	20.3165	20.1625	19.6478	19.0524	18.5806	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9925	0.9876	0.9738	0.9310	0.8277	0.6472	0.4717	0.5350	0.8021	0.9536	0.9868	0.9938	(94)
Ext temp.	367.9799	407.2926	450.8783	491.2536	479.3914	374.5690	259.5299	268.7555	357.7952	372.8112	355.4698	352.4537	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Month fracti	1045.9181	1013.4037	920.5098	773.4326	600.2104	403.9380	265.2124	278.4143	433.2619	650.2899	862.4918	1042.0384	(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	(98)
Space heating per m ²	504.3860	407.3066	349.4058	203.1689	89.8893	0.0000	0.0000	0.0000	0.0000	206.4442	365.0558	513.0510	(98)
												2638.7077	(98)
												50.5693	(99)

8c. Space cooling requirement

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FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													93.5000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													2822.1473	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	504.3860	407.3066	349.4058	203.1689	89.8893	0.0000	0.0000	0.0000	0.0000	206.4442	365.0558	513.0510	(98)	
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)	
Space heating fuel (main heating system)	539.4503	435.6221	373.6961	217.2929	96.1383	0.0000	0.0000	0.0000	0.0000	220.7959	390.4341	548.7177	(211)	
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)	
Water heating														
Water heating requirement	170.3536	150.3259	158.2890	142.4695	140.0311	125.7202	121.3089	132.3303	131.8512	147.7046	155.4609	166.4486	(64)	
Efficiency of water heater (217)m	87.5366	87.3429	86.8685	85.7601	83.6674	79.8000	79.8000	79.8000	79.8000	85.7070	87.0153	87.6220	(217)	
Fuel for water heating, kWh/month	194.6084	172.1101	182.2169	166.1255	167.3663	157.5441	152.0161	165.8274	165.2270	172.3366	178.6593	189.9620	(219)	
Water heating fuel used												2063.9997	(219)	
Annual totals kWh/year														
Space heating fuel - main system												2822.1473	(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)												241.1132	(232)	
Total delivered energy for all uses												5202.2602	(238)	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2822.1473	0.2160	609.5838 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2063.9997	0.2160	445.8239 (264)
Space and water heating			1055.4078 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	241.1132	0.5190	125.1377 (268)
Total CO2, kg/m2/year			1219.4705 (272)
Emissions per m2 for space and water heating			20.2263 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.3982 (272b)
Emissions per m2 for pumps and fans			0.7460 (272c)
Target Carbon Dioxide Emission Rate (TER) = (20.2263 * 1.55) + 2.3982 + 0.7460, rounded to 2 d.p.			34.4900 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	0007-Conversion-Flat-2			Issued on Date	12/04/2022
Assessment Reference	Be Green	Prop Type Ref	Conversion Flat 2		
Property	Conversion Flat 2, 233, London Road, East Reading, Reading, Berkshire, RG1 3NY				
SAP Rating	79 C	DER	34.73	TER	36.37
Environmental	82 B	% DER<TER	4.51		
CO ₂ Emissions (t/year)	0.95	DFEE	83.89	TFEE	59.64
General Requirements Compliance	Fail	% DFEE<TFEE	-40.66		
Assessor Details	Mr. Andrew Taylor, Andrew Taylor, Tel: 01636 653 055, andy@mesbuildingsolutions.co.uk			Assessor ID	P741-0001
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 35 m²

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

1a TER and DER

Fuel for main heating:Electricity
Fuel factor:1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 36.37 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 34.73 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)59.6 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)83.9 kWh/m²/yrFail
Excess energy =24.3 kWh/m²/yr (40.8%)

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.20 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.05 (max. 0.25)	0.05 (max. 0.70)	OK
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using default y-value of 0.15

3 Air permeability

Air permeability at 50 pascals: 15.00 (assumed) OK

4 Heating efficiency

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

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls: No cylinder

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames Valley): Not significant OK

Based on:

Overshading: Average
Windows facing East: 4.19 m², No overhang
Windows facing South: 3.83 m², No overhang
Air change rate: 8.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.10 W/m²K
Exposed floor U-value 0.10 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	34.7300 (1b)	x 2.6000 (2b)	= 90.2980 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	34.7300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 90.2980 (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) = 0.2215 (8)
Pressure test					No
Measured/design AP50					15.0000
Infiltration rate					0.9715 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.8258 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	1.0529	1.0322	1.0116	0.9083	0.8877	0.7845	0.7845	0.7638	0.8258	0.8877	0.9290	0.9703 (22b)
Effective ac	1.0529	1.0322	1.0116	0.9125	0.8940	0.8077	0.8077	0.7917	0.8409	0.8940	0.9315	0.9707 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.40)			8.0200	1.3258	10.6326		(27)
Door			1.8900	1.4000	2.6460		(26)
REFURB -Floor to Commerical			34.7300	0.0500	1.7365	110.0000	3820.3000 (28b)
REFURB - External Wall	35.4600	9.9100	25.5500	0.2000	5.1100	190.0000	4854.5000 (29a)
REFURB - Wall onto Stairwell	22.7000		22.7000	0.2000	4.5400	18.0000	408.6000 (29a)
REFURB - Flat Roof onto Stair	3.2900		3.2900	0.0970	0.3191	9.0000	29.6100 (30)
Total net area of external elements Aum(A, m ²)			96.1800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	24.9842		(33)
Party Wall 1			12.7700	0.0000	0.0000	45.0000	574.6500 (32)
Party Floor 1			1.5300			30.0000	45.9000 (32d)
Party Ceilings 1			32.9800			30.0000	989.4000 (32b)
Stud			48.9000			9.0000	440.1000 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 11163.0600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							321.4241 (35)
Thermal bridges (Default value 0.150 * total exposed area)							14.4270 (36)
Total fabric heat loss							(33) + (36) = 39.4112 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	31.3732	30.7581	30.1429	27.1923	26.6398	24.0682	24.0682	23.5920	25.0587	26.6398	27.7574	28.9257 (38)
Heat transfer coeff	70.7844	70.1692	69.5541	66.6034	66.0510	63.4794	63.4794	63.0031	64.4699	66.0510	67.1686	68.3369 (39)
Average = Sum(39)m / 12 =												66.5959 (39)
HLP	2.0381	2.0204	2.0027	1.9177	1.9018	1.8278	1.8278	1.8141	1.8563	1.9018	1.9340	1.9677 (40)
HLP (average)												1.9175 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.2744 (42)
Average daily hot water use (litres/day)												64.4668 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	70.9135	68.3349	65.7562	63.1775	60.5988	58.0202	58.0202	60.5988	63.1775	65.7562	68.3349	70.9135 (44)
Energy content (annual)	105.1627	91.9760	94.9110	82.7457	79.3965	68.5131	63.4875	72.8528	73.7229	85.9169	93.7850	101.8445 (45)
Distribution loss (46)m = 0.15 x (45)m												1014.3145 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	15.7744	13.7964	14.2366	12.4119	11.9095	10.2770	9.5231	10.9279	11.0584	12.8875	14.0678	15.2767 (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)
Total heat required for water heating calculated for each month	105.1627	91.9760	94.9110	82.7457	79.3965	68.5131	63.4875	72.8528	73.7229	85.9169	93.7850	101.8445 (62)
Solar input	0.0000	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	105.1627	91.9760	94.9110	82.7457	79.3965	68.5131	63.4875	72.8528	73.7229	85.9169	93.7850	101.8445 (64)
Heat gains from water heating, kWh/month	34.9666	30.5820	31.5579	27.5129	26.3993	22.7806	21.1096	24.2236	24.5129	28.5674	31.1835	33.8633 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	63.7197	63.7197	63.7197	63.7197	63.7197	63.7197	63.7197	63.7197	63.7197	63.7197	63.7197	63.7197	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	9.6767	8.5948	6.9898	5.2917	3.9556	3.3395	3.6084	4.6904	6.2954	7.9935	9.3296	9.9457	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	108.5435	109.6698	106.8315	100.7890	93.1614	85.9926	81.2033	80.0770	82.9154	88.9579	96.5854	103.7543	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.3720	29.3720	29.3720	29.3720	29.3720	29.3720	29.3720	29.3720	29.3720	29.3720	29.3720	29.3720	(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)	-50.9757	-50.9757	-50.9757	-50.9757	-50.9757	-50.9757	-50.9757	-50.9757	-50.9757	-50.9757	-50.9757	-50.9757	(71)
Water heating gains (Table 5)	46.9981	45.5089	42.4165	38.2124	35.4830	31.6397	28.3731	32.5585	34.0456	38.3970	43.3104	45.5152	(72)
Total internal gains	210.3342	208.8895	201.3537	189.4090	177.7159	166.0877	158.3008	162.4418	168.3723	180.4642	194.3413	204.3310	(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				4.1900	19.6403	0.6300	0.7000	0.7700	25.1497 (76)			
South				3.8300	46.7521	0.6300	0.7000	0.7700	54.7232 (78)			
Solar gains	79.8729	138.8207	195.1856	247.1955	279.2736	277.6422	267.5642	244.0130	213.4893	155.0441	96.2244	67.9678 (83)
Total gains	290.2072	347.7101	396.5392	436.6045	456.9895	443.7299	425.8650	406.4548	381.8616	335.5083	290.5657	272.2988 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.8070	44.1910	44.5819	46.5569	46.9463	48.8482	48.8482	49.2174	48.0976	46.9463	46.1652	45.3759	
alpha	3.9205	3.9461	3.9721	4.1038	4.1298	4.2565	4.2565	4.2812	4.2065	4.1298	4.0777	4.0251	
util living area	0.9969	0.9934	0.9850	0.9613	0.9033	0.7724	0.6138	0.6553	0.8642	0.9728	0.9941	0.9977	(86)
MIT	19.2602	19.4680	19.7901	20.2353	20.6002	20.8727	20.9641	20.9529	20.7707	20.2846	19.7260	19.2761	(87)
Th 2	19.3080	19.3198	19.3315	19.3887	19.3996	19.4506	19.4506	19.4602	19.4308	19.3996	19.3777	19.3550	(88)
util rest of house	0.9955	0.9903	0.9774	0.9401	0.8456	0.6414	0.4184	0.4639	0.7632	0.9535	0.9907	0.9966	(89)
MIT 2	17.1004	17.4101	17.8837	18.5531	19.0446	19.3822	19.4425	19.4477	19.2780	18.6401	17.8243	17.1532	(90)
Living area fraction	18.3336	18.5851	18.9722	19.5136	19.9328	20.2332	20.3113	20.3071	20.1303	19.5791	18.9101	18.3653	(92)
Temperature adjustment	18.3336	18.5851	18.9722	19.5136	19.9328	20.2332	20.3113	20.3071	20.1303	19.5791	18.9101	18.3653	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9943	0.9883	0.9753	0.9421	0.8681	0.7139	0.5324	0.5756	0.8151	0.9563	0.9894	0.9956	(94)
Ext temp.	288.5530	343.6558	386.7329	411.3358	396.7183	316.7616	226.7275	233.9532	311.2589	320.8604	287.4811	271.1098	(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	993.3588	960.2714	867.4934	706.9000	543.7852	357.5945	235.5915	246.1594	388.7737	593.0763	793.2694	968.0150	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating per m2	524.3755	414.3657	357.6858	212.8062	109.4178	0.0000	0.0000	0.0000	0.0000	202.5286	364.1676	518.4975	(98)
												2703.8448	(98)
												77.8533	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													175.1000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1544.1718 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	524.3755	414.3657	357.6858	212.8062	109.4178	0.0000	0.0000	0.0000	0.0000	202.5286	364.1676	518.4975	(98)
Space heating efficiency (main heating system 1)	175.1000	175.1000	175.1000	175.1000	175.1000	0.0000	0.0000	0.0000	0.0000	175.1000	175.1000	175.1000	(210)
Space heating fuel (main heating system)	299.4720	236.6452	204.2752	121.5341	62.4888	0.0000	0.0000	0.0000	0.0000	115.6645	207.9769	296.1151	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	105.1627	91.9760	94.9110	82.7457	79.3965	68.5131	63.4875	72.8528	73.7229	85.9169	93.7850	101.8445	(64)
Efficiency of water heater (217)m	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	(216)
Fuel for water heating, kWh/month	60.0587	52.5277	54.2039	47.2562	45.3435	39.1280	36.2578	41.6064	42.1033	49.0673	53.5608	58.1636	(219)
Water heating fuel used													(219)
Annual totals kWh/year													
Space heating fuel - main system													1544.1718 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
central heating pump													30.0000 (230c)
Total electricity for the above, kWh/year													30.0000 (231)
Electricity for lighting (calculated in Appendix L)													170.8941 (232)
Total delivered energy for all uses													2324.3431 (238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1544.1718	0.5190	801.4251 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	579.2773	0.5190	300.6449 (264)
Space and water heating			1102.0700 (265)
Pumps and fans	30.0000	0.5190	15.5700 (267)
Energy for lighting	170.8941	0.5190	88.6940 (268)
Total CO2, kg/year			1206.3341 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			34.7300 (273)

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

DER			34.7300 ZC1
Total Floor Area		TFA	34.7300
Assumed number of occupants		N	1.2744
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			18.5202 ZC2
CO2 emissions from cooking, equation (L16)			4.3071 ZC3
Total CO2 emissions			57.5573 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			57.5573 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	34.7300 (1b)	x 2.6000 (2b)	= 90.2980 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	34.7300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 90.2980 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				2 * 10 =	20.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) = 0.2215 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4715 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.4008 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	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	0.5110	0.5010	0.4909	0.4408	0.4308	0.3807	0.3807	0.3707	0.4008	0.4308	0.4509	0.4709 (22b)
	0.6305	0.6255	0.6205	0.5972	0.5928	0.5725	0.5725	0.5687	0.5803	0.5928	0.6016	0.6109 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			6.7900	1.3258	9.0019		(27)
REFURB -Floor to Commercial			34.7300	0.1300	4.5149		(28b)
REFURB - External Wall	35.4600	8.6800	26.7800	0.1800	4.8204		(29a)
REFURB - Wall onto Stairwell	22.7000		22.7000	0.1800	4.0860		(29a)
REFURB - Flat Roof onto Stair	3.2900		3.2900	0.1300	0.4277		(30)
Total net area of external elements Aum(A, m ²)			96.1800				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.7409		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (User defined value 0.050 * total exposed area)							4.8090 (36)
Total fabric heat loss						(33) + (36) =	29.5499 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	18.7893	18.6382	18.4902	17.7947	17.6646	17.0589	17.0589	16.9467	17.2922	17.6646	17.9278	18.2030 (38)
Heat transfer coeff	48.3392	48.1881	48.0401	47.3446	47.2145	46.6087	46.6087	46.4966	46.8421	47.2145	47.4777	47.7529 (39)
Average = Sum(39)m / 12 =												47.3440 (39)
HLP	1.3919	1.3875	1.3832	1.3632	1.3595	1.3420	1.3420	1.3388	1.3487	1.3595	1.3671	1.3750 (40)
HLP (average)												1.3632 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.2744 (42)
Average daily hot water use (litres/day)												64.4668 (43)
Daily hot water use	70.9135	68.3349	65.7562	63.1775	60.5988	58.0202	58.0202	60.5988	63.1775	65.7562	68.3349	70.9135 (44)
Energy conte	105.1627	91.9760	94.9110	82.7457	79.3965	68.5131	63.4875	72.8528	73.7229	85.9169	93.7850	101.8445 (45)
Energy content (annual)										Total = Sum(45)m =		1014.3145 (45)
Distribution loss (46)m = 0.15 x (45)m	15.7744	13.7964	14.2366	12.4119	11.9095	10.2770	9.5231	10.9279	11.0584	12.8875	14.0678	15.2767 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)

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Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	151.7576	134.0617	141.5059	127.8375	125.9914	113.6049	110.0824	119.4477	118.8147	132.5118	138.8769	148.4394 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
								Solar input (sum of months) =	Sum(63)m =			0.0000 (64)
Output from w/h	151.7576	134.0617	141.5059	127.8375	125.9914	113.6049	110.0824	119.4477	118.8147	132.5118	138.8769	148.4394 (64)
								Total per year (kWh/year) =	Sum(64)m =			1562.9319 (65)
Heat gains from water heating, kWh/month	72.2425	64.2506	68.8338	63.5864	63.6752	58.8541	58.3855	61.4995	60.5863	65.8433	67.2570	71.1392 (65)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1517.0028 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	291.5673	221.6686	178.7340	96.9003	40.8024	0.0000	0.0000	0.0000	0.0000	92.7258	197.4751	298.5240	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	311.8367	237.0787	191.1594	103.6367	43.6389	0.0000	0.0000	0.0000	0.0000	99.1720	211.2034	319.2770	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	151.7576	134.0617	141.5059	127.8375	125.9914	113.6049	110.0824	119.4477	118.8147	132.5118	138.8769	148.4394	(64)
Efficiency of water heater (217)m	86.5284	86.1468	85.4379	84.0866	82.1768	79.8000	79.8000	79.8000	79.8000	83.8829	85.7525	86.6418	(216)
Fuel for water heating, kWh/month	175.3848	155.6200	165.6242	152.0308	153.3175	142.3621	137.9478	149.6838	148.8906	157.9724	161.9508	171.3254	(219)
Water heating fuel used												1872.1102	(219)
Annual totals kWh/year													
Space heating fuel - main system												1517.0028	(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)												172.5339	(232)
Total delivered energy for all uses												3636.6469	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1517.0028	0.2160	327.6726 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1872.1102	0.2160	404.3758 (264)
Space and water heating			732.0484 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	172.5339	0.5190	89.5451 (268)
Total CO2, kg/m2/year			860.5185 (272)
Emissions per m2 for space and water heating			21.0783 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.5783 (272b)
Emissions per m2 for pumps and fans			1.1208 (272c)
Target Carbon Dioxide Emission Rate (TER) = (21.0783 * 1.55) + 2.5783 + 1.1208, rounded to 2 d.p.			36.3700 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	0007-Conversion-Flat-3				Issued on Date	12/04/2022
Assessment Reference	Be Green	Prop Type Ref	Conversion Flat 3			
Property	Conversion Flat 3, 233, London Road, East Reading, Reading, Berkshire, RG1 3NY					
SAP Rating		81 B	DER	30.71	TER	32.52
Environmental		83 B	% DER<TER	5.55		
CO ₂ Emissions (t/year)		0.95	DFEE	72.80	TFEE	51.21
General Requirements Compliance		Fail	% DFEE<TFEE	-42.17		
Assessor Details	Mr. Andrew Taylor, Andrew Taylor, Tel: 01636 653 055, andy@mesbuildingsolutions.co.uk				Assessor ID	P741-0001
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 38 m²

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

1a TER and DER

Fuel for main heating:Electricity
Fuel factor:1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 32.52 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 30.71 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)51.2 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)72.8 kWh/m²/yrFail
Excess energy =21.6 kWh/m²/yr (42.2%)

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.20 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	OK
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using default y-value of 0.15

3 Air permeability

Air permeability at 50 pascals: 15.00 (assumed) OK

4 Heating efficiency

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

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls: No cylinder

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames Valley): Slight OK

Based on:

Overshading: Average
Windows facing North: 1.89 m², No overhang
Windows facing East: 2.84 m², No overhang
Windows facing South: 3.04 m², No overhang
Air change rate: 8.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value	0.00 W/m ² K
Roof U-value	0.11 W/m ² K
Roof U-value	0.11 W/m ² K
Exposed floor U-value	0.12 W/m ² K

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	38.4300 (1b)	x 2.3300 (2b)	= 89.5419 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	38.4300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 89.5419 (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) = 0.2234 (8)
Pressure test					No
Measured/design AP50					15.0000
Infiltration rate					0.9734 (18)
Number of sides sheltered					2 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.8274 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	1.0549	1.0342	1.0135	0.9101	0.8894	0.7860	0.7860	0.7653	0.8274	0.8894	0.9308	0.9721 (22b)
Effective ac	1.0549	1.0342	1.0135	0.9141	0.8955	0.8089	0.8089	0.7928	0.8423	0.8955	0.9332	0.9725 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.40)			5.8800	1.3258	7.7955		(27)
Door			1.8900	1.4000	2.6460		(26)
Glazed Door (Uw = 1.40)			1.8900	1.3258	2.5057		(27)
REFURB - Floor to Stairwell			5.4500	0.1157	0.6305	110.0000	599.5000 (28b)
REFURB - External Wall	29.4500	9.6600	19.7900	0.2000	3.9580	190.0000	3760.1000 (29a)
REFURB - Wall onto Stairwell	14.4000		14.4000	0.2000	2.8800	18.0000	259.2000 (29a)
REFURB - External Plane Roof	33.1500		33.1500	0.1100	3.6465	9.0000	298.3500 (30)
REFURB - External Sloped Roof	5.9800		5.9800	0.1100	0.6578	9.0000	53.8200 (30)
Total net area of external elements Aum(A, m ²)			88.4300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	24.7200		(33)
Party Wall 1			14.6700	0.0000	0.0000	45.0000	660.1500 (32)
Party Floor 1			32.9800			30.0000	989.4000 (32d)
Stud			42.5000			9.0000	382.5000 (32c)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Default value 0.150 * total exposed area)
Total fabric heat loss

(28)...(30) + (32) + (32a)...(32e) = 7003.0200 (34)												
182.2279 (35)												
13.2645 (36)												
(33) + (36) = 37.9845 (37)												
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 31.1704	Feb 30.5592	Mar 29.9480	Apr 27.0115	May 26.4616	Jun 23.9017	Jul 23.9017	Aug 23.4276	Sep 24.8877	Oct 26.4616	Nov 27.5741	Dec 28.7371 (38)
Heat transfer coeff	69.1549	68.5437	67.9325	64.9960	64.4461	61.8862	61.8862	61.4121	62.8722	64.4461	65.5586	66.7216 (39)
Average = Sum(39)m / 12 =												64.9880 (39)
HLP	Jan 1.7995	Feb 1.7836	Mar 1.7677	Apr 1.6913	May 1.6770	Jun 1.6104	Jul 1.6104	Aug 1.5980	Sep 1.6360	Oct 1.6770	Nov 1.7059	Dec 1.7362 (40)
HLP (average)												1.6911 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.3653 (42)
Average daily hot water use (litres/day)												66.6250 (43)
Daily hot water use	Jan 73.2875	Feb 70.6225	Mar 67.9575	Apr 65.2925	May 62.6275	Jun 59.9625	Jul 59.9625	Aug 62.6275	Sep 65.2925	Oct 67.9575	Nov 70.6225	Dec 73.2875 (44)
Energy conte	108.6832	95.0550	98.0883	85.5157	82.0544	70.8067	65.6128	75.2916	76.1909	88.7931	96.9246	105.2539 (45)
Energy content (annual)										Total = Sum(45)m =		1048.2701 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	16.3025	14.2583	14.7132	12.8274	12.3082	10.6210	9.8419	11.2937	11.4286	13.3190	14.5387	15.7881 (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)
Total heat required for water heating calculated for each month	108.6832	95.0550	98.0883	85.5157	82.0544	70.8067	65.6128	75.2916	76.1909	88.7931	96.9246	105.2539 (62)
Solar input	0.0000	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	108.6832	95.0550	98.0883	85.5157	82.0544	70.8067	65.6128	75.2916	76.1909	88.7931	96.9246	105.2539 (64)
Heat gains from water heating, kWh/month	36.1372	31.6058	32.6143	28.4340	27.2831	23.5432	21.8163	25.0345	25.3335	29.5237	32.2274	34.9969 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 1048.2701 (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	68.2631	68.2631	68.2631	68.2631	68.2631	68.2631	68.2631	68.2631	68.2631	68.2631	68.2631	68.2631 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	10.5470	9.3677	7.6183	5.7676	4.3113	3.6398	3.9329	5.1122	6.8616	8.7123	10.1686	10.8401 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	117.6061	118.8265	115.7512	109.2042	100.9397	93.1723	87.9832	86.7629	89.8382	96.3852	104.6496	112.4170 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.8263	29.8263	29.8263	29.8263	29.8263	29.8263	29.8263	29.8263	29.8263	29.8263	29.8263	29.8263 (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)	-54.6105	-54.6105	-54.6105	-54.6105	-54.6105	-54.6105	-54.6105	-54.6105	-54.6105	-54.6105	-54.6105	-54.6105 (71)
Water heating gains (Table 5)	48.5714	47.0324	43.8365	39.4916	36.6708	32.6989	29.3229	33.6485	35.1854	39.6824	44.7603	47.0389 (72)
Total internal gains	223.2034	221.7056	213.6849	200.9423	188.4008	175.9900	167.7180	172.0025	178.3640	191.2589	206.0574	216.7749 (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			2.8400		19.6403		0.6300		0.7000		0.7700		17.0466 (76)
South			3.0400		46.7521		0.6300		0.7000		0.7700		43.4356 (78)
North			1.8900		10.6334		0.6300		0.7000		0.7700		6.1419 (74)
Solar gains	66.6242	116.2207	165.4775	214.5452	248.0368	249.3881	239.1467	213.8479	182.5097	130.2680	80.3180	56.6709	(83)
Total gains	289.8276	337.9262	379.1624	415.4875	436.4375	425.3781	406.8647	385.8504	360.8737	321.5269	286.3754	273.4458	(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	28.1294	28.3802	28.6355	29.9293	30.1846	31.4332	31.4332	31.6759	30.9403	30.1846	29.6724	29.1552
alpha	2.8753	2.8920	2.9090	2.9953	3.0123	3.0955	3.0955	3.1117	3.0627	3.0123	2.9782	2.9437
util living area	0.9859	0.9771	0.9608	0.9243	0.8548	0.7282	0.5901	0.6293	0.8183	0.9399	0.9780	0.9881 (86)
MIT	18.6504	18.9026	19.3111	19.8879	20.3728	20.7574	20.9095	20.8882	20.6128	19.9799	19.2608	18.6704 (87)
Th 2	19.4703	19.4815	19.4927	19.5471	19.5574	19.6057	19.6057	19.6148	19.5870	19.5574	19.5366	19.5150 (88)
util rest of house	0.9820	0.9708	0.9493	0.9003	0.8035	0.6263	0.4343	0.4785	0.7366	0.9160	0.9708	0.9848 (89)
MIT 2	16.4433	16.8145	17.4098	18.2601	18.9253	19.4272	19.5673	19.5620	19.2630	18.4095	17.3682	16.4968 (90)
Living area fraction	0.9820	0.9708	0.9493	0.9003	0.8035	0.6263	0.4343	0.4785	0.7366	0.9160	0.9708	0.9848 (89)
MIT	17.7114	18.0143	18.5022	19.1954	19.7569	20.1915	20.3385	20.3239	20.0385	19.3118	18.4556	17.7457 (92)
Temperature adjustment	17.7114	18.0143	18.5022	19.1954	19.7569	20.1915	20.3385	20.3239	20.0385	19.3118	18.4556	17.7457 (93)
adjusted MIT	17.7114	18.0143	18.5022	19.1954	19.7569	20.1915	20.3385	20.3239	20.0385	19.3118	18.4556	17.7457 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9755	0.9623	0.9393	0.8931	0.8117	0.6731	0.5212	0.5612	0.7665	0.9108	0.9634	0.9792 (94)
Ext temp.	282.7194	325.1907	356.1375	371.0840	354.2727	286.3381	212.0617	216.5385	276.6215	292.8326	275.8992	267.7449 (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	927.4625	898.8995	815.3406	669.1580	519.2386	346.0354	231.3603	240.9768	373.3679	561.4393	744.4589	903.7884 (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	479.6888	385.5323	341.6471	214.6133	122.7346	0.0000	0.0000	0.0000	0.0000	199.8434	337.3630	473.2164 (98)
												2554.6390 (98)
												66.4751 (99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													175.1000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1458.9600 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	479.6888	385.5323	341.6471	214.6133	122.7346	0.0000	0.0000	0.0000	0.0000	199.8434	337.3630	473.2164	(98)
Space heating efficiency (main heating system 1)	175.1000	175.1000	175.1000	175.1000	175.1000	0.0000	0.0000	0.0000	0.0000	175.1000	175.1000	175.1000	(210)
Space heating fuel (main heating system)	273.9514	220.1784	195.1154	122.5661	70.0940	0.0000	0.0000	0.0000	0.0000	114.1310	192.6687	270.2549	(211)
Water heating requirement	0.0000	0.0000	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	108.6832	95.0550	98.0883	85.5157	82.0544	70.8067	65.6128	75.2916	76.1909	88.7931	96.9246	105.2539	(64)
Efficiency of water heater (217)m	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	(216)
Fuel for water heating, kWh/month	62.0692	54.2861	56.0184	48.8382	46.8614	40.4379	37.4716	42.9992	43.5128	50.7099	55.3539	60.1107	(219)
Water heating fuel used												598.6694	(219)
Annual totals kWh/year													
Space heating fuel - main system												1458.9600	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
Total electricity for the above, kWh/year												30.0000	(231)
Electricity for lighting (calculated in Appendix L)												186.2627	(232)
Total delivered energy for all uses												2273.8921	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1458.9600	0.5190	757.2002 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	598.6694	0.5190	310.7094 (264)
Space and water heating			1067.9097 (265)
Pumps and fans	30.0000	0.5190	15.5700 (267)
Energy for lighting	186.2627	0.5190	96.6703 (268)
Total CO2, kg/year			1180.1500 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			30.7100 (273)

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

DER		30.7100 ZC1
Total Floor Area	TFA	38.4300
Assumed number of occupants	N	1.3653
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		18.1345 ZC2
CO2 emissions from cooking, equation (L16)		3.9492 ZC3
Total CO2 emissions		52.7937 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		52.7937 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	38.4300 (1b)	x 2.3300 (2b)	= 89.5419 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	38.4300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 89.5419 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	+	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				2 * 10 =	20.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					20.0000 / (5) =
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4734 (18)
					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.4024 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	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	0.5130	0.5029	0.4929	0.4426	0.4325	0.3822	0.3822	0.3722	0.4024	0.4325	0.4526	0.4728 (22b)
	0.6316	0.6265	0.6215	0.5979	0.5935	0.5731	0.5731	0.5693	0.5809	0.5935	0.6024	0.6118 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			7.7200	1.3258	10.2348		(27)
REFURB - Floor to Stairwell			5.4500	0.1300	0.7085		(28b)
REFURB - External Wall	29.4500	9.6100	19.8400	0.1800	3.5712		(29a)
REFURB - Wall onto Stairwell	14.4000		14.4000	0.1800	2.5920		(29a)
REFURB - External Plane Roof	33.1500		33.1500	0.1300	4.3095		(30)
REFURB - External Sloped Roof	5.9800		5.9800	0.1300	0.7774		(30)
Total net area of external elements Aum(A, m ²)			88.4300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.0834		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (User defined value 0.050 * total exposed area)							4.4215 (36)
Total fabric heat loss						(33) + (36) =	28.5049 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	18.6626	18.5116	18.3636	17.6685	17.5385	16.9330	16.9330	16.8209	17.1662	17.5385	17.8016	18.0766 (38)
Heat transfer coeff	47.1676	47.0166	46.8686	46.1735	46.0434	45.4380	45.4380	45.3259	45.6712	46.0434	46.3065	46.5816 (39)
Average = Sum(39)m / 12 =												46.1728 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2274	1.2234	1.2196	1.2015	1.1981	1.1824	1.1824	1.1794	1.1884	1.1981	1.2050	1.2121 (40)
HLP (average)												1.2015 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.3653 (42)
Average daily hot water use (litres/day)												66.6250 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	73.2875	70.6225	67.9575	65.2925	62.6275	59.9625	59.9625	62.6275	65.2925	67.9575	70.6225	73.2875 (44)
Energy content (annual)	108.6832	95.0550	98.0883	85.5157	82.0544	70.8067	65.6128	75.2916	76.1909	88.7931	96.9246	105.2539 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1048.2701 (45)
Water storage loss:	16.3025	14.2583	14.7132	12.8274	12.3082	10.6210	9.8419	11.2937	11.4286	13.3190	14.5387	15.7881 (46)
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	155.2781	137.1407	144.6832	130.6076	128.6493	115.8985	112.2077	121.8865	121.2827	135.3880	142.0165	151.8488 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h	155.2781	137.1407	144.6832	130.6076	128.6493	115.8985	112.2077	121.8865	121.2827	135.3880	142.0165	151.8488 (64)
Heat gains from water heating, kWh/month	73.4131	65.2744	69.8903	64.5074	64.5590	59.6167	59.0922	62.3104	61.4069	66.7996	68.3009	72.2728 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	68.2631	68.2631	68.2631	68.2631	68.2631	68.2631	68.2631	68.2631	68.2631	68.2631	68.2631	68.2631 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	10.5537	9.3737	7.6232	5.7713	4.3141	3.6421	3.9355	5.1155	6.8660	8.7179	10.1751	10.8471 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	117.6061	118.8265	115.7512	109.2042	100.9397	93.1723	87.9832	86.7629	89.8382	96.3852	104.6496	112.4170 (68)
Pumps, fans	29.8263	29.8263	29.8263	29.8263	29.8263	29.8263	29.8263	29.8263	29.8263	29.8263	29.8263	29.8263 (69)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (Table 5)	-54.6105	-54.6105	-54.6105	-54.6105	-54.6105	-54.6105	-54.6105	-54.6105	-54.6105	-54.6105	-54.6105	-54.6105 (71)
Total internal gains	98.6735	97.1345	93.9385	89.5937	86.7728	82.8010	79.4250	83.7505	85.2874	89.7844	94.8624	97.1409 (72)
	273.3122	271.8136	263.7918	251.0480	238.5056	226.0944	217.8226	222.1078	228.4705	241.3665	256.1660	266.8839 (73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains
	m2	Table 6a	Specific data	Specific data	factor	W
		W/m2	or Table 6b	or Table 6c	Table 6d	
North	1.8800	10.6334	0.6300	0.7000	0.7700	6.1094 (74)
East	2.8200	19.6403	0.6300	0.7000	0.7700	16.9265 (76)
South	3.0200	46.7521	0.6300	0.7000	0.7700	43.1499 (78)
Solar gains	66.1859	115.4557	164.3890	213.1379	246.4150	247.7604
Total gains	339.4981	387.2694	428.1809	464.1859	484.9206	473.8547

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	56.5802	56.7619	56.9411	57.7983	57.9616	58.7339	58.7339	58.8792	58.4340	57.9616	57.6323	57.2920
util living area	4.7720	4.7841	4.7961	4.8532	4.8641	4.9156	4.9156	4.9253	4.8956	4.8641	4.8422	4.8195
	0.9897	0.9798	0.9567	0.8960	0.7741	0.5909	0.4347	0.4730	0.7067	0.9163	0.9790	0.9917 (86)
MIT	19.9114	20.0896	20.3485	20.6543	20.8720	20.9738	20.9952	20.9928	20.9380	20.6630	20.2384	19.8834 (87)
Th 2	19.8982	19.9013	19.9044	19.9188	19.9215	19.9341	19.9341	19.9365	19.9293	19.9215	19.9160	19.9103 (88)
util rest of house	0.9864	0.9736	0.9432	0.8648	0.7136	0.5021	0.3317	0.3672	0.6198	0.8840	0.9714	0.9890 (89)
MIT 2	18.4833	18.7418	19.1113	19.5382	19.8062	19.9182	19.9325	19.9338	19.8857	19.5616	18.9694	18.4515 (90)
Living area fraction	19.3039	19.5162	19.8221	20.1795	20.4186	20.5247	20.5431	20.5423	20.4903	20.1944	19.6985	19.2742 (92)
Temperature adjustment	19.3039	19.5162	19.8221	20.1795	20.4186	20.5247	20.5431	20.5423	20.4903	20.1944	19.6985	0.0000
adjusted MIT	19.3039	19.5162	19.8221	20.1795	20.4186	20.5247	20.5431	20.5423	20.4903	20.1944	19.6985	19.2742 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9841	0.9709	0.9420	0.8731	0.7429	0.5523	0.3910	0.4281	0.6672	0.8932	0.9695	0.9870 (94)
Ext temp.	334.1147	375.9870	403.3553	405.2950	360.2710	261.7252	178.0533	186.0310	273.4118	331.1927	325.7024	318.9917 (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	707.6958	687.2022	624.3893	520.8126	401.4330	269.2064	179.1660	187.7522	291.8523	441.7596	583.3928	702.1804 (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	277.9443	209.1366	164.4493	83.1727	30.6245	0.0000	0.0000	0.0000	0.0000	82.2618	185.5371	285.0923 (98)
												1318.2187 (98)
												34.3018 (99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1409.8596 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	277.9443	209.1366	164.4493	83.1727	30.6245	0.0000	0.0000	0.0000	0.0000	82.2618	185.5371	285.0923	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	297.2667	223.6756	175.8816	88.9547	32.7535	0.0000	0.0000	0.0000	0.0000	87.9806	198.4354	304.9116	(211)
Water heating requirement	0.0000	0.0000	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	155.2781	137.1407	144.6832	130.6076	128.6493	115.8985	112.2077	121.8865	121.2827	135.3880	142.0165	151.8488	(64)
Efficiency of water heater (217)m	86.3501	85.9365	85.1560	83.6477	81.6563	79.8000	79.8000	79.8000	79.8000	83.5328	85.5278	86.4706	(216)
Fuel for water heating, kWh/month	179.8240	159.5838	169.9037	156.1400	157.5497	145.2362	140.6112	152.7400	151.9833	162.0777	166.0470	175.6073	(219)
Water heating fuel used												1917.3041	(219)
Annual totals kWh/year													
Space heating fuel - main system												1409.8596	(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)												186.3822	(232)
Total delivered energy for all uses												3588.5459	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1409.8596	0.2160	304.5297 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1917.3041	0.2160	414.1377 (264)
Space and water heating			718.6674 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	186.3822	0.5190	96.7323 (268)
Total CO2, kg/m2/year			854.3247 (272)
Emissions per m2 for space and water heating			18.7007 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.5171 (272b)
Emissions per m2 for pumps and fans			1.0129 (272c)
Target Carbon Dioxide Emission Rate (TER) = (18.7007 * 1.55) + 2.5171 + 1.0129, rounded to 2 d.p.			32.5200 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	0007-New-Build-Flat-1			Issued on Date	12/04/2022
Assessment Reference	Be Green	Prop Type Ref	New Build Flat 1		
Property	New Build Flat 1, 233, London Road, East Reading, Reading, Berkshire, RG1 3NY				
SAP Rating	85 B	DER	19.51	TER	30.06
Environmental	87 B	% DER<TER	35.09		
CO ₂ Emissions (t/year)	0.95	DFEE	40.67	TFEE	57.93
General Requirements Compliance	Pass	% DFEE<TFEE	29.80		
Assessor Details	Mr. Andrew Taylor, Andrew Taylor, Tel: 01636 653 055, andy@mesbuildingsolutions.co.uk			Assessor ID	P741-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

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

DWELLING AS DESIGNED

Ground-floor flat, total floor area 61 m²

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

1a TER and DER

Fuel for main heating: Electricity
Fuel factor: 1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 30.06 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 19.51 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 57.9 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 40.7 kWh/m²/yr OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.28 (max. 2.00)	1.80 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using user-specified ψ -value of 0.039

3 Air permeability

Air permeability at 50 pascals:	5.10 (design value)	
Maximum	10.0	OK

4 Heating efficiency

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

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls: No cylinder

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames Valley): Slight OK

Based on:

Overshading: Average
Windows facing North: 2.70 m², No overhang
Windows facing East: 5.62 m², No overhang
Windows facing South: 3.15 m², No overhang
Air change rate: 6.00 ach
Blinds/curtains: None

10 Key features

Roof U-value 0.10 W/m²K
Floor U-value 0.10 W/m²K
Thermal bridging ψ -value 0.039 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	61.3400 (1b)	x 2.4000 (2b)	= 147.2160 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.3400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 147.2160 (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) = 0.1359 (8)
Pressure test					Yes
Measured/design AP50					5.1000
Infiltration rate					0.3909 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3322 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4236	0.4153	0.4070	0.3654	0.3571	0.3156	0.3156	0.3073	0.3322	0.3571	0.3738	0.3904 (22b)
Effective ac	0.5897	0.5862	0.5828	0.5668	0.5638	0.5498	0.5498	0.5472	0.5552	0.5638	0.5698	0.5762 (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
Window (Uw = 1.20)			8.3200	1.1450	9.5267		(27)
Door			1.8900	1.8000	3.4020		(26)
Glazed Door (Uw = 1.20)			3.1500	1.1450	3.6069		(27)
Ground Floor			61.3400	0.1000	6.1340	110.0000	6747.4000 (28a)
External Wall	83.7600	13.3600	70.4000	0.1500	10.5600	60.0000	4224.0000 (29a)
Flat Roof to Stairwell	3.3200		3.3200	0.0970	0.3220	9.0000	29.8800 (30)
Total net area of external elements Aum(A, m ²)			148.4200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.5516		(33)
Party Ceilings			58.0100			30.0000	1740.3000 (32b)
Stud			86.6400			9.0000	779.7600 (32c)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			13521.3400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							220.4327 (35)
Thermal bridges (User defined value 0.039 * total exposed area)							5.7884 (36)
Total fabric heat loss						(33) + (36) =	39.3400 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	28.6490	28.4798	28.3139	27.5347	27.3889	26.7103	26.7103	26.5846	26.9717	27.3889	27.6839	27.9922 (38)
Heat transfer coeff	67.9890	67.8198	67.6539	66.8747	66.7289	66.0503	66.0503	65.9246	66.3117	66.7289	67.0239	67.3322 (39)
Average = Sum(39)m / 12 =												66.8740 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1084	1.1056	1.1029	1.0902	1.0879	1.0768	1.0768	1.0747	1.0811	1.0879	1.0927	1.0977 (40)
HLP (average)												1.0902 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.0193 (42)
Average daily hot water use (litres/day)	82.1574 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	90.3731	87.0868	83.8005	80.5142	77.2279	73.9416	73.9416	77.2279	80.5142	83.8005	87.0868	90.3731 (44)
Energy conte	134.0207	117.2153	120.9557	105.4521	101.1838	87.3140	80.9092	92.8445	93.9534	109.4936	119.5208	129.7919 (45)
Energy content (annual)										Total = Sum(45)m =		1292.6551 (45)
Distribution loss (46)m = 0.15 x (45)m	20.1031	17.5823	18.1434	15.8178	15.1776	13.0971	12.1364	13.9267	14.0930	16.4240	17.9281	19.4688 (46)
Water storage loss:												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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)
Total heat required for water heating calculated for each month	134.0207	117.2153	120.9557	105.4521	101.1838	87.3140	80.9092	92.8445	93.9534	109.4936	119.5208	129.7919	(62)
Solar input	0.0000	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	134.0207	117.2153	120.9557	105.4521	101.1838	87.3140	80.9092	92.8445	93.9534	109.4936	119.5208	129.7919	(64)
Heat gains from water heating, kWh/month	44.5619	38.9741	40.2178	35.0628	33.6436	29.0319	26.9023	30.8708	31.2395	36.4066	39.7407	43.1558	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	100.9629	100.9629	100.9629	100.9629	100.9629	100.9629	100.9629	100.9629	100.9629	100.9629	100.9629	100.9629	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	15.9619	14.1772	11.5297	8.7287	6.5248	5.5085	5.9522	7.7368	10.3844	13.1854	15.3893	16.4055	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	176.3134	178.1429	173.5325	163.7173	151.3274	139.6826	131.9032	130.0736	134.6841	144.4993	156.8892	168.5339	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.0963	33.0963	33.0963	33.0963	33.0963	33.0963	33.0963	33.0963	33.0963	33.0963	33.0963	33.0963	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-80.7703	-80.7703	-80.7703	-80.7703	-80.7703	-80.7703	-80.7703	-80.7703	-80.7703	-80.7703	-80.7703	-80.7703	(71)
Water heating gains (Table 5)	59.8950	57.9972	54.0562	48.6984	45.2199	40.3221	36.1590	41.4930	43.3882	48.9336	55.1954	58.0051	(72)
Total internal gains	308.4591	306.6062	295.4072	277.4332	259.3610	241.8021	230.3033	235.5923	244.7455	262.9071	283.7627	299.2334	(73)

6. Solar gains

[Jan]												
					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W
North					2.7000	10.6334	0.6300	0.7000			0.7700	8.7742 (74)
East					5.6200	19.6403	0.6300	0.7000			0.7700	33.7330 (76)
South					3.1500	46.7521	0.6300	0.7000			0.7700	45.0073 (78)
Solar gains	87.5146	156.4673	231.0612	310.3826	366.4781	371.2637	354.9056	312.4774	258.7338	177.7651	106.2343	73.9455 (83)
Total gains	395.9737	463.0735	526.4684	587.8158	625.8391	613.0657	585.2088	548.0698	503.4794	440.6722	389.9969	373.1789 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
tau	55.2431	55.3810	55.5168	56.1636	56.2863	56.8647	56.8647	56.9731	56.6405	56.2863	56.0387	55.7821		
alpha	4.6829	4.6921	4.7011	4.7442	4.7524	4.7910	4.7910	4.7982	4.7760	4.7524	4.7359	4.7188		
util living area	0.9953	0.9896	0.9744	0.9286	0.8227	0.6487	0.4877	0.5384	0.7851	0.9545	0.9905	0.9964	(86)	
MIT	19.7374	19.9202	20.2020	20.5498	20.8192	20.9571	20.9911	20.9860	20.8934	20.5325	20.0682	19.7039	(87)	
Th 2	19.9940	19.9962	19.9984	20.0088	20.0108	20.0198	20.0198	20.0215	20.0163	20.0108	20.0068	20.0027	(88)	
util rest of house	0.9939	0.9866	0.9668	0.9070	0.7728	0.5646	0.3835	0.4310	0.7108	0.9363	0.9872	0.9954	(89)	
MIT 2	18.3140	18.5811	18.9889	19.4837	19.8331	19.9901	20.0162	20.0152	19.9299	19.4712	18.8055	18.2712	(90)	
Living area fraction	18.8939	19.1267	19.4831	19.9180	20.2348	20.3841	20.4134	20.4107	20.3224	19.9036	19.3199	18.8549	(91)	
MIT	18.8939	19.1267	19.4831	19.9180	20.2348	20.3841	20.4134	20.4107	20.3224	19.9036	19.3199	18.8549	(92)	
Temperature adjustment												0.0000		
adjusted MIT	18.8939	19.1267	19.4831	19.9180	20.2348	20.3841	20.4134	20.4107	20.3224	19.9036	19.3199	18.8549	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains	392.7330	455.2657	506.3694	531.8265	491.3216	366.0724	249.3266	260.1988	370.4890	411.5315	383.8257	370.8100	(94)	
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)	
Heat loss rate W	992.2233	964.8491	878.3587	736.8270	569.5182	382.0394	251.8731	264.4028	412.6171	620.8182	819.0258	986.7454	(97)	
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)	
Space heating kWh	446.0208	342.4401	276.7600	147.6004	58.1783	0.0000	0.0000	0.0000	0.0000	155.7093	313.3441	458.2560	(98)	
Space heating												2198.3088	(98)	
Space heating per m2												35.8381	(99)	

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													175.1000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1255.4591 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	446.0208	342.4401	276.7600	147.6004	58.1783	0.0000	0.0000	0.0000	0.0000	155.7093	313.3441	458.2560	(98)
Space heating efficiency (main heating system 1)	175.1000	175.1000	175.1000	175.1000	175.1000	0.0000	0.0000	0.0000	0.0000	175.1000	175.1000	175.1000	(210)
Space heating fuel (main heating system)	254.7235	195.5683	158.0582	84.2949	33.2257	0.0000	0.0000	0.0000	0.0000	88.9259	178.9515	261.7110	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	134.0207	117.2153	120.9557	105.4521	101.1838	87.3140	80.9092	92.8445	93.9534	109.4936	119.5208	129.7919	(64)
Efficiency of water heater	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	(216)
Fuel for water heating, kWh/month	76.5395	66.9419	69.0781	60.2240	57.7863	49.8652	46.2074	53.0237	53.6570	62.5320	68.2586	74.1244	(219)
Water heating fuel used												738.2382	(219)
Annual totals kWh/year													
Space heating fuel - main system												1255.4591	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
Total electricity for the above, kWh/year												30.0000	(231)
Electricity for lighting (calculated in Appendix L)												281.8924	(232)
Total delivered energy for all uses												2305.5897	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1255.4591	0.5190	651.5832 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	738.2382	0.5190	383.1456 (264)
Space and water heating			1034.7289 (265)
Pumps and fans	30.0000	0.5190	15.5700 (267)
Energy for lighting	281.8924	0.5190	146.3022 (268)
Total CO2, kg/year			1196.6010 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			19.5100 (273)

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

DER		19.5100	ZC1
Total Floor Area	TFA	61.3400	
Assumed number of occupants	N	2.0193	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.0329	ZC2
CO2 emissions from cooking, equation (L16)		2.7301	ZC3
Total CO2 emissions		39.2729	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		39.2729	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	61.3400 (1b)	x 2.4000 (2b)	= 147.2160 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.3400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 147.2160 (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) = 0.1359 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3859 (18)
					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3280 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	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	0.4182	0.4100	0.4018	0.3608	0.3526	0.3116	0.3116	0.3034	0.3280	0.3526	0.3690	0.3854 (22b)
	0.5874	0.5840	0.5807	0.5651	0.5622	0.5485	0.5485	0.5460	0.5538	0.5622	0.5681	0.5743 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			11.4700	1.3258	15.2064		(27)
Ground Floor			61.3400	0.1300	7.9742		(28a)
External Wall	83.7600	13.3600	70.4000	0.1800	12.6720		(29a)
Flat Roof to Stairwell	3.3200		3.3200	0.1300	0.4316		(30)
Total net area of external elements Aum(A, m ²)			148.4200				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	38.1742	(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)							11.6345 (36)
Total fabric heat loss						(33) + (36) =	49.8087 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	28.5383	28.3733	28.2116	27.4523	27.3102	26.6488	26.6488	26.5263	26.9036	27.3102	27.5976	27.8981 (38)
Heat transfer coeff												
Average = Sum(39)m / 12 =	78.3470	78.1821	78.0204	77.2610	77.1189	76.4575	76.4575	76.3351	76.7123	77.1189	77.4063	77.7068 (39)
												77.2603 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2773	1.2746	1.2719	1.2596	1.2572	1.2465	1.2465	1.2445	1.2506	1.2572	1.2619	1.2668 (40)
HLP (average)												1.2595 (40)
Days in month												
	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0193 (42)
Average daily hot water use (litres/day)												82.1574 (43)
Daily hot water use												
Energy conte	90.3731	87.0868	83.8005	80.5142	77.2279	73.9416	73.9416	77.2279	80.5142	83.8005	87.0868	90.3731 (44)
Energy content (annual)	134.0207	117.2153	120.9557	105.4521	101.1838	87.3140	80.9092	92.8445	93.9534	109.4936	119.5208	129.7919 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1292.6551 (45)
	20.1031	17.5823	18.1434	15.8178	15.1776	13.0971	12.1364	13.9267	14.0930	16.4240	17.9281	19.4688 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	180.6156	159.3011	167.5506	150.5440	147.7787	132.4058	127.5041	139.4394	139.0452	156.0885	164.6127	176.3868 (62)
Solar input	0.0000	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	180.6156	159.3011	167.5506	150.5440	147.7787	132.4058	127.5041	139.4394	139.0452	156.0885	164.6127	176.3868 (64)
Heat gains from water heating, kWh/month	81.8378	72.6427	77.4937	71.1363	70.9195	65.1054	64.1782	68.1467	67.3130	73.6825	75.8141	80.4317 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	100.9629	100.9629	100.9629	100.9629	100.9629	100.9629	100.9629	100.9629	100.9629	100.9629	100.9629	100.9629 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	15.9619	14.1772	11.5297	8.7287	6.5248	5.5085	5.9522	7.7368	10.3844	13.1854	15.3893	16.4055 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	176.3134	178.1429	173.5325	163.7173	151.3274	139.6826	131.9032	130.0736	134.6841	144.4993	156.8892	168.5339 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.0963	33.0963	33.0963	33.0963	33.0963	33.0963	33.0963	33.0963	33.0963	33.0963	33.0963	33.0963 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-80.7703	-80.7703	-80.7703	-80.7703	-80.7703	-80.7703	-80.7703	-80.7703	-80.7703	-80.7703	-80.7703	-80.7703 (71)
Water heating gains (Table 5)	109.9970	108.0992	104.1582	98.8004	95.3220	90.4241	86.2611	91.5951	93.4902	99.0357	105.2974	108.1072 (72)
Total internal gains	358.5612	356.7082	345.5092	327.5353	309.4630	291.9041	280.4053	285.6944	294.8476	313.0092	333.8647	349.3355 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North				2.7000	10.6334	0.6300	0.7000	0.7700	8.7742 (74)			
East				5.6200	19.6403	0.6300	0.7000	0.7700	33.7330 (76)			
South				3.1500	46.7521	0.6300	0.7000	0.7700	45.0073 (78)			
Solar gains	87.5146	156.4673	231.0612	310.3826	366.4781	371.2637	354.9056	312.4774	258.7338	177.7651	106.2343	73.9455 (83)
Total gains	446.0757	513.1756	576.5705	637.9178	675.9411	663.1678	635.3109	598.1718	553.5814	490.7743	440.0990	423.2810 (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	54.3700	54.4847	54.5976	55.1342	55.2358	55.7136	55.7136	55.8030	55.5285	55.2358	55.0307	54.8179
alpha	4.6247	4.6323	4.6398	4.6756	4.6824	4.7142	4.7142	4.7202	4.7019	4.6824	4.6687	4.6545
util living area	0.9954	0.9907	0.9780	0.9399	0.8475	0.6819	0.5167	0.5664	0.8056	0.9585	0.9908	0.9964 (86)
MIT	19.7066	19.8767	20.1501	20.4967	20.7832	20.9441	20.9878	20.9815	20.8747	20.5020	20.0399	19.6752 (87)
Th 2	19.8587	19.8608	19.8629	19.8727	19.8745	19.8830	19.8830	19.8846	19.8797	19.8745	19.8708	19.8669 (88)
util rest of house	0.9939	0.9875	0.9703	0.9182	0.7941	0.5847	0.3921	0.4392	0.7227	0.9390	0.9872	0.9952 (89)
MIT 2	18.1588	18.4073	18.8030	19.2966	19.6685	19.8473	19.8788	19.8774	19.7844	19.3149	18.6531	18.1187 (90)
Living area fraction	18.7894	19.0059	19.3519	19.7856	20.1227	20.2941	20.3306	20.3272	20.2286	19.7986	19.2181	18.7528 (92)
Temperature adjustment	18.7894	19.0059	19.3519	19.7856	20.1227	20.2941	20.3306	20.3272	20.2286	19.7986	19.2181	18.7528 (93)
adjusted MIT	18.7894	19.0059	19.3519	19.7856	20.1227	20.2941	20.3306	20.3272	20.2286	19.7986	19.2181	18.7528 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	442.4545	505.1368	556.9020	584.4822	545.6308	412.7536	281.5906	293.9352	415.9031	460.0401	433.1795	420.5380 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1135.1982	1102.8278	1002.7068	841.0288	649.5471	435.3606	285.2324	299.7838	470.1387	709.3830	938.0152	1130.8531 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	515.4013	401.6484	331.6787	184.7136	77.3138	0.0000	0.0000	0.0000	0.0000	185.5111	363.4817	528.4745 (98)
Space heating												2588.2230 (98)
Space heating per m2												42.1947 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2768.1529 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	515.4013	401.6484	331.6787	184.7136	77.3138	0.0000	0.0000	0.0000	0.0000	185.5111	363.4817	528.4745	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	551.2313	429.5704	354.7366	197.5546	82.6885	0.0000	0.0000	0.0000	0.0000	198.4076	388.7505	565.2134	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	180.6156	159.3011	167.5506	150.5440	147.7787	132.4058	127.5041	139.4394	139.0452	156.0885	164.6127	176.3868	(64)
Efficiency of water heater (217)m	87.4569	87.1803	86.6027	85.3605	83.1778	79.8000	79.8000	79.8000	79.8000	85.2753	86.8692	87.5620	(216)
Fuel for water heating, kWh/month	206.5194	182.7259	193.4703	176.3626	177.6660	165.9221	159.7796	174.7361	174.2421	183.0406	189.4948	201.4423	(219)
Water heating fuel used													(219)
Annual totals kWh/year													
Space heating fuel - main system													2768.1529 (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)													281.8924 (232)
Total delivered energy for all uses													5310.4472 (238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2768.1529	0.2160	597.9210 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2185.4019	0.2160	472.0468 (264)
Space and water heating			1069.9678 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	281.8924	0.5190	146.3022 (268)
Total CO2, kg/m2/year			1255.1950 (272)
Emissions per m2 for space and water heating			17.4432 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.3851 (272b)
Emissions per m2 for pumps and fans			0.6346 (272c)
Target Carbon Dioxide Emission Rate (TER) = (17.4432 * 1.55) + 2.3851 + 0.6346, rounded to 2 d.p.			30.0600 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	0007-New-Build-Flat-2			Issued on Date	12/04/2022
Assessment Reference	Be Green	Prop Type Ref	New Build Flat 2		
Property	New Build Flat 2, 233, London Road, East Reading, Reading, Berkshire, RG1 3NY				
SAP Rating	86 B	DER	18.05	TER	28.23
Environmental	88 B	% DER<TER	36.06		
CO ₂ Emissions (t/year)	0.86	DFEE	35.49	TFEE	50.31
General Requirements Compliance	Pass	% DFEE<TFEE	29.46		
Assessor Details	Mr. Andrew Taylor, Andrew Taylor, Tel: 01636 653 055, andy@mesbuildingsolutions.co.uk			Assessor ID	P741-0001
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 58 m²

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

1a TER and DER

Fuel for main heating:Electricity

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 28.23 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 18.05 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)50.3 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)35.5 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Floor (no floor)			
Roof	0.08 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.23 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.048

3 Air permeability

Air permeability at 50 pascals:	5.10 (design value)	
Maximum	10.0	OK

4 Heating efficiency

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

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls: No cylinder

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames Valley): Slight OK

Based on:

Overshading:	Average
Windows facing North:	2.70 m ² , No overhang
Windows facing East:	5.62 m ² , No overhang
Windows facing South:	3.15 m ² , No overhang
Air change rate:	6.00 ach
Blinds/curtains:	None

10 Key features

External wall U-value	0.14 W/m ² K
Roof U-value	0.10 W/m ² K
Roof U-value	0.08 W/m ² K

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	58.0100 (1b)	x 2.4000 (2b)	= 139.2240 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	58.0100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 139.2240 (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) = 0.1437 (8)
Pressure test					Yes
Measured/design AP50					5.1000
Infiltration rate					0.3987 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3389 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	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	0.4320	0.4236	0.4151	0.3727	0.3643	0.3219	0.3219	0.3134	0.3389	0.3643	0.3812	0.3982 (22b)
	0.5933	0.5897	0.5862	0.5695	0.5663	0.5518	0.5518	0.5491	0.5574	0.5663	0.5727	0.5793 (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
Window (Uw = 1.20)			8.3200	1.1450	9.5267		(27)
Glazed Door (Uw = 1.20)			3.1500	1.1450	3.6069		(27)
Door to Corridor			1.8900	1.4000	2.6460		(26)
External Wall	71.3000	11.4700	59.8300	0.1500	8.9745	60.0000	3589.8000 (29a)
Wall onto Stairwell	6.9400	1.8900	5.0500	0.1342	0.6776	9.0000	45.4500 (29a)
Flat Roof to Stairwell	3.3100		3.3100	0.0970	0.3210	9.0000	29.7900 (30)
Roof onto Roof Space	14.0400		14.0400	0.0769	1.0800	9.0000	126.3600 (30)
Total net area of external elements Aum(A, m ²)			95.5900				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.8327		(33)
Party Floor			58.0100			30.0000	1740.3000 (32d)
Party Ceiling			40.6700			30.0000	1220.1000 (32b)
Stud			73.6400			9.0000	662.7600 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 7414.5600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							127.8152 (35)
Thermal bridges (User defined value 0.048 * total exposed area)							4.5883 (36)
Total fabric heat loss							(33) + (36) = 31.4210 (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	27.2599	27.0934	26.9302	26.1636	26.0202	25.3525	25.3525	25.2288	25.6097	26.0202	26.3103	26.6136 (38)
Heat transfer coeff	58.6809	58.5144	58.3512	57.5846	57.4412	56.7735	56.7735	56.6499	57.0307	57.4412	57.7314	58.0347 (39)
Average = Sum(39)m / 12 =												57.5839 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0116	1.0087	1.0059	0.9927	0.9902	0.9787	0.9787	0.9766	0.9831	0.9902	0.9952	1.0004 (40)
HLP (average)												0.9927 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.9248 (42)
Average daily hot water use (litres/day)												79.9151 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	87.9066	84.7100	81.5134	78.3168	75.1202	71.9236	71.9236	75.1202	78.3168	81.5134	84.7100	87.9066 (44)
Energy conte	130.3630	114.0163	117.6546	102.5741	98.4223	84.9310	78.7010	90.3106	91.3892	106.5053	116.2588	126.2496 (45)
Energy content (annual)												Total = Sum(45)m = 1257.3758 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	19.5544	17.1024	17.6482	15.3861	14.7633	12.7396	11.8052	13.5466	13.7084	15.9758	17.4388	18.9374 (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)
Total heat required for water heating calculated for each month	130.3630	114.0163	117.6546	102.5741	98.4223	84.9310	78.7010	90.3106	91.3892	106.5053	116.2588	126.2496 (62)
Solar input	0.0000	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	130.3630	114.0163	117.6546	102.5741	98.4223	84.9310	78.7010	90.3106	91.3892	106.5053	116.2588	126.2496 (64)
Heat gains from water heating, kWh/month	43.3457	37.9104	39.1202	34.1059	32.7254	28.2395	26.1681	30.0283	30.3869	35.4130	38.6561	41.9780 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	96.2423	96.2423	96.2423	96.2423	96.2423	96.2423	96.2423	96.2423	96.2423	96.2423	96.2423	96.2423	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	15.0926	13.4051	10.9018	8.2534	6.1695	5.2085	5.6280	7.3155	9.8188	12.4673	14.5512	15.5121	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	167.9017	169.6440	165.2535	155.9065	144.1078	133.0186	125.6103	123.8680	128.2585	137.6054	149.4042	160.4934	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.6242	32.6242	32.6242	32.6242	32.6242	32.6242	32.6242	32.6242	32.6242	32.6242	32.6242	32.6242	(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)	-76.9939	-76.9939	-76.9939	-76.9939	-76.9939	-76.9939	-76.9939	-76.9939	-76.9939	-76.9939	-76.9939	-76.9939	(71)
Water heating gains (Table 5)	58.2603	56.4143	52.5809	47.3693	43.9858	39.2216	35.1722	40.3606	42.2040	47.5981	53.6890	56.4220	(72)
Total internal gains	296.1273	294.3361	283.6088	266.4019	249.1357	232.3214	221.2832	226.4168	235.1541	252.5435	272.5170	287.3002	(73)

6. Solar gains

[Jan]														
	Area m2				Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W	
North	2.7000				10.6334		0.6300		0.7000		0.7700		8.7742 (74)	
East	5.6200				19.6403		0.6300		0.7000		0.7700		33.7330 (76)	
South	3.1500				46.7521		0.6300		0.7000		0.7700		45.0073 (78)	
Solar gains	87.5146	156.4673	231.0612	310.3826	366.4781	371.2637	354.9056	312.4774	258.7338	177.7651	106.2343	73.9455	(83)	
Total gains	383.6419	450.8034	514.6700	576.7845	615.6138	603.5851	576.1887	538.8942	493.8879	430.3086	378.7513	361.2457	(84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	35.0983	35.1982	35.2966	35.7665	35.8558	36.2775	36.2775	36.3566	36.1139	35.8558	35.6756	35.4891	
alpha	3.3399	3.3465	3.3531	3.3844	3.3904	3.4185	3.4185	3.4238	3.4076	3.3904	3.3784	3.3659	
util living area	0.9730	0.9539	0.9164	0.8388	0.7147	0.5547	0.4191	0.4619	0.6787	0.8795	0.9566	0.9774	(86)
MIT	19.3308	19.5898	19.9680	20.4105	20.7390	20.9207	20.9768	20.9676	20.8382	20.3936	19.7828	19.2830	(87)
Th 2	20.0737	20.0761	20.0784	20.0894	20.0915	20.1011	20.1011	20.1029	20.0974	20.0915	20.0873	20.0830	(88)
util rest of house	0.9684	0.9463	0.9026	0.8127	0.6704	0.4897	0.3390	0.3797	0.6166	0.8538	0.9481	0.9736	(89)
MIT 2	17.8408	18.2149	18.7553	19.3776	19.8103	20.0329	20.0871	20.0820	19.9450	19.3702	18.5050	17.7778	(90)
Living area fraction									fLA = Living area / (4) =			0.5413	(91)
MIT	18.6473	18.9591	19.4117	19.9367	20.3130	20.5134	20.5687	20.5613	20.4285	19.9242	19.1966	18.5926	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6473	18.9591	19.4117	19.9367	20.3130	20.5134	20.5687	20.5613	20.4285	19.9242	19.1966	18.5926	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	367.9990	421.4318	458.5430	465.9425	419.7047	314.0452	219.6886	227.7121	316.3676	365.0817	355.1975	348.7194	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	841.9131	822.6621	753.4140	635.5446	494.7420	335.7264	225.3162	235.7393	360.9169	535.5920	698.3560	835.2676	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	352.5921	269.6267	219.3840	122.1135	55.8277	0.0000	0.0000	0.0000	0.0000	126.8596	247.0741	361.9918	(98)
Space heating												1755.4697	(98)
Space heating per m2												(98) / (4) =	30.2615 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													175.1000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1002.5527 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	352.5921	269.6267	219.3840	122.1135	55.8277	0.0000	0.0000	0.0000	0.0000	126.8596	247.0741	361.9918	(98)
Space heating efficiency (main heating system 1)	175.1000	175.1000	175.1000	175.1000	175.1000	0.0000	0.0000	0.0000	0.0000	175.1000	175.1000	175.1000	(210)
Space heating fuel (main heating system)	201.3661	153.9844	125.2907	69.7393	31.8833	0.0000	0.0000	0.0000	0.0000	72.4498	141.1046	206.7343	(211)
Water heating requirement	0.0000	0.0000	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	130.3630	114.0163	117.6546	102.5741	98.4223	84.9310	78.7010	90.3106	91.3892	106.5053	116.2588	126.2496	(64)
Efficiency of water heater	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	(216)
Fuel for water heating, kWh/month	74.4506	65.1150	67.1928	58.5803	56.2092	48.5043	44.9463	51.5766	52.1926	60.8254	66.3957	72.1014	(219)
Water heating fuel used												718.0901	(219)
Annual totals kWh/year													
Space heating fuel - main system												1002.5527	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
Total electricity for the above, kWh/year												30.0000	(231)
Electricity for lighting (calculated in Appendix L)												266.5405	(232)
Total delivered energy for all uses												2017.1833	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1002.5527	0.5190	520.3248 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	718.0901	0.5190	372.6888 (264)
Space and water heating			893.0136 (265)
Pumps and fans	30.0000	0.5190	15.5700 (267)
Energy for lighting	266.5405	0.5190	138.3345 (268)
Total CO2, kg/year			1046.9181 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			18.0500 (273)

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

DER		18.0500	ZC1
Total Floor Area	TFA	58.0100	
Assumed number of occupants	N	1.9248	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.1514	ZC2
CO2 emissions from cooking, equation (L16)		2.8477	ZC3
Total CO2 emissions		38.0491	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		38.0491	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	58.0100 (1b)	x 2.4000 (2b)	= 139.2240 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	58.0100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 139.2240 (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) = 0.1437 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3937 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3346 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4266	0.4183	0.4099	0.3681	0.3597	0.3179	0.3179	0.3095	0.3346	0.3597	0.3764	0.3932 (22b)
Effective ac	0.5910	0.5875	0.5840	0.5677	0.5647	0.5505	0.5505	0.5479	0.5560	0.5647	0.5709	0.5773 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			1.8900	1.0000	1.8900			(26)				
TER Opening Type (Uw = 1.40)			11.4700	1.3258	15.2064			(27)				
External Wall	71.3000	11.4700	59.8300	0.1800	10.7694			(29a)				
Wall onto Stairwell	6.9400	1.8900	5.0500	0.1800	0.9090			(29a)				
Flat Roof to Stairwell	3.3100		3.3100	0.1300	0.4303			(30)				
Roof onto Roof Space	14.0400		14.0400	0.1300	1.8252			(30)				
Total net area of external elements Aum(A, m2)			95.5900					(31)				
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		31.0303			(33)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								9.1610 (36)				
Total fabric heat loss						(33) + (36) =		40.1913 (37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	27.1530	26.9906	26.8315	26.0840	25.9442	25.2932	25.2932	25.1726	25.5439	25.9442	26.2271	26.5229 (38)
Heat transfer coeff	67.3443	67.1820	67.0228	66.2754	66.1355	65.4845	65.4845	65.3639	65.7353	66.1355	66.4184	66.7142 (39)
Average = Sum(39)m / 12 =												66.2747 (39)
HLP	1.1609	1.1581	1.1554	1.1425	1.1401	1.1288	1.1288	1.1268	1.1332	1.1401	1.1449	1.1500 (40)
HLP (average)												1.1425 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.9248 (42)
Average daily hot water use (litres/day)												79.9151 (43)
Daily hot water use	87.9066	84.7100	81.5134	78.3168	75.1202	71.9236	71.9236	75.1202	78.3168	81.5134	84.7100	87.9066 (44)
Energy conte	130.3630	114.0163	117.6546	102.5741	98.4223	84.9310	78.7010	90.3106	91.3892	106.5053	116.2588	126.2496 (45)
Energy content (annual)										Total = Sum(45)m =		1257.3758 (45)
Distribution loss (46)m = 0.15 x (45)m												
19.5544	17.1024	17.6482	15.3861	14.7633	12.7396	11.8052	13.5466	13.7084	15.9758	17.4388	18.9374 (46)	
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage												
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month												
176.9579	156.1020	164.2495	147.6660	145.0172	130.0228	125.2959	136.9055	136.4810	153.1002	161.3507	172.8445	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum (63)m =											0.0000	(63)
Output from w/h												
176.9579	156.1020	164.2495	147.6660	145.0172	130.0228	125.2959	136.9055	136.4810	153.1002	161.3507	172.8445	(64)
Total per year (kWh/year) = Sum (64)m =											1805.9932	(64)
Heat gains from water heating, kWh/month												
80.6216	71.5790	76.3961	70.1794	70.0013	64.3130	63.4440	67.3042	66.4604	72.6889	74.7295	79.2539	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	96.2423	96.2423	96.2423	96.2423	96.2423	96.2423	96.2423	96.2423	96.2423	96.2423	96.2423	96.2423	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	15.0926	13.4051	10.9018	8.2534	6.1695	5.2085	5.6280	7.3155	9.8188	12.4673	14.5512	15.5121	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	167.9017	169.6440	165.2535	155.9065	144.1078	133.0186	125.6103	123.8680	128.2585	137.6054	149.4042	160.4934	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.6242	32.6242	32.6242	32.6242	32.6242	32.6242	32.6242	32.6242	32.6242	32.6242	32.6242	32.6242	(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)	-76.9939	-76.9939	-76.9939	-76.9939	-76.9939	-76.9939	-76.9939	-76.9939	-76.9939	-76.9939	-76.9939	-76.9939	(71)
Water heating gains (Table 5)	108.3624	106.5164	102.6829	97.4713	94.0878	89.3236	85.2742	90.4626	92.3061	97.7002	103.7910	106.5241	(72)
Total internal gains	346.2294	344.4382	333.7108	316.5039	299.2378	282.4234	271.3852	276.5188	285.2561	302.6456	322.6191	337.4023	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W		
North				2.7000	10.6334	0.6300	0.7000	0.7700		8.7742 (74)		
East				5.6200	19.6403	0.6300	0.7000	0.7700		33.7330 (76)		
South				3.1500	46.7521	0.6300	0.7000	0.7700		45.0073 (78)		

Solar gains	87.5146	156.4673	231.0612	310.3826	366.4781	371.2637	354.9056	312.4774	258.7338	177.7651	106.2343	73.9455 (83)
Total gains	433.7439	500.9055	564.7721	626.8865	665.7158	653.6871	626.2908	588.9962	543.9900	480.4107	428.8534	411.3478 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.8190	59.9636	60.1060	60.7839	60.9124	61.5180	61.5180	61.6314	61.2833	60.9124	60.6529	60.3840	
alpha	4.9879	4.9976	5.0071	5.0523	5.0608	5.1012	5.1012	5.1088	5.0856	5.0608	5.0435	5.0256	
util living area	0.9947	0.9884	0.9712	0.9188	0.8003	0.6156	0.4553	0.5023	0.7516	0.9447	0.9887	0.9959	(86)
MIT	19.8799	20.0518	20.3154	20.6337	20.8665	20.9729	20.9951	20.9922	20.9274	20.6205	20.1910	19.8487	(87)
Th 2	19.9514	19.9537	19.9559	19.9663	19.9682	19.9773	19.9773	19.9790	19.9738	19.9682	19.9643	19.9602	(88)
util rest of house	0.9929	0.9847	0.9618	0.8928	0.7436	0.5278	0.3520	0.3950	0.6686	0.9211	0.9844	0.9945	(89)
MIT 2	18.4762	18.7270	19.1063	19.5538	19.8452	19.9605	19.9757	19.9760	19.9206	19.5477	18.9383	18.4371	(90)
Living area fraction	fLA = Living area / (4) =											0.5413	(91)
MIT	19.2360	19.4441	19.7607	20.1383	20.3980	20.5085	20.5275	20.5260	20.4656	20.1284	19.6164	19.2012	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2360	19.4441	19.7607	20.1383	20.3980	20.5085	20.5275	20.5260	20.4656	20.1284	19.6164	19.2012	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation	0.9914	0.9824	0.9597	0.8977	0.7686	0.5745	0.4081	0.4533	0.7106	0.9254	0.9825	0.9932	(94)	
Useful gains	430.0037	492.0878	542.0142	562.7405	511.6994	375.5731	255.5648	266.9681	386.5549	444.5727	421.3460	408.5565	(95)	
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)	
Heat loss rate W	1005.8579	977.1019	888.7728	744.8242	575.2480	386.9139	257.1896	269.6943	418.4425	630.1642	831.3201	1000.7913	(97)	
Month fracti	1.0000	1.0000		1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)	
Space heating kWh	428.4356	325.9295	257.9884	131.1003	47.2802	0.0000	0.0000	0.0000	0.0000	138.0801	295.1813	440.6227	(98)	
Space heating												2064.6180	(98)	
Space heating per m2												(98) / (4) =	35.5907	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												93.5000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												2208.1475 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	428.4356	325.9295	257.9884	131.1003	47.2802	0.0000	0.0000	0.0000	0.0000	138.0801	295.1813	440.6227 (98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000 (210)
Space heating fuel (main heating system)	458.2198	348.5877	275.9234	140.2142	50.5670	0.0000	0.0000	0.0000	0.0000	147.6793	315.7020	471.2542 (211)
Water heating requirement	0.0000	0.0000	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	176.9579	156.1020	164.2495	147.6660	145.0172	130.0228	125.2959	136.9055	136.4810	153.1002	161.3507	172.8445 (64)
Efficiency of water heater (217)m	87.0868	86.7338	86.0136	84.4984	82.1892	79.8000	79.8000	79.8000	79.8000	84.5399	86.4053	79.8000 (216)
Fuel for water heating, kWh/month	203.1972	179.9783	190.9575	174.7560	176.4431	162.9359	157.0125	171.5608	171.0289	181.0982	186.7370	198.2036 (219)
Water heating fuel used												2153.9089 (219)
Annual totals kWh/year												
Space heating fuel - main system												2208.1475 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												75.0000 (231)
Electricity for lighting (calculated in Appendix L)												266.5405 (232)
Total delivered energy for all uses												4703.5969 (238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2208.1475	0.2160	476.9599 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2153.9089	0.2160	465.2443 (264)
Space and water heating			942.2042 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	266.5405	0.5190	138.3345 (268)
Total CO2, kg/m2/year			1119.4637 (272)
Emissions per m2 for space and water heating			16.2421 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.3847 (272b)
Emissions per m2 for pumps and fans			0.6710 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.2421 * 1.55) + 2.3847 + 0.6710, rounded to 2 d.p.			28.2300 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	0007-New-Build-Flat-3				Issued on Date	12/04/2022
Assessment Reference	Be Green	Prop Type Ref	New Build Flat 3			
Property	New Build Flat 3, 233, London Road, East Reading, Reading, Berkshire, RG1 3NY					
SAP Rating	86 B	DER	22.09	TER	34.05	
Environmental	87 B	% DER<TER	35.12			
CO ₂ Emissions (t/year)	0.75	DFEE	42.94	TFEE	57.72	
General Requirements Compliance	Pass	% DFEE<TFEE	25.60			
Assessor Details	Mr. Andrew Taylor, Andrew Taylor, Tel: 01636 653 055, andy@mesbuildingsolutions.co.uk				Assessor ID	P741-0001
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 41 m²

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

1a TER and DER

Fuel for main heating: Electricity

Fuel factor: 1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 34.05 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 22.09 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 57.7 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE) 42.9 kWh/m²/yr OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.11 (max. 0.30)	0.18 (max. 0.70)	OK
Floor	(no floor)		
Roof	0.10 (max. 0.20)	0.14 (max. 0.35)	OK
Openings	1.25 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using user-specified ψ -value of 0.089

3 Air permeability

Air permeability at 50 pascals:	5.10 (design value)	
Maximum	10.0	OK

4 Heating efficiency

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

Secondary heating system: None

5 Cylinder insulation

Hot water storage: No cylinder

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls: No cylinder

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames Valley): Slight OK

Based on:

Overshading: Average
Windows facing North: 1.35 m², No overhang
Windows facing East: 2.23 m², No overhang
Windows facing South: 1.89 m², No overhang
Air change rate: 6.00 ach
Blinds/curtains: None

10 Key features

External wall U-value	0.14 W/m ² K
External wall U-value	0.08 W/m ² K
Roof U-value	0.10 W/m ² K
Roof U-value	0.10 W/m ² K

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	40.6700 (1b)	x 2.2200 (2b)	= 90.2874 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	40.6700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 90.2874 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				2 * 10 =	20.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) = 0.2215 (8)
Pressure test					Yes
Measured/design AP50					5.1000
Infiltration rate					0.4765 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.4050 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.5164	0.5063	0.4962	0.4455	0.4354	0.3848	0.3848	0.3747	0.4050	0.4354	0.4557	0.4759 (22b)
Effective ac	0.6333	0.6282	0.6231	0.5993	0.5948	0.5740	0.5740	0.5702	0.5820	0.5948	0.6038	0.6132 (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
Window (Uw = 1.20)			3.5800	1.1450	4.0992		(27)
Glazed Door (Uw = 1.20)			1.8900	1.1450	2.1641		(27)
Door to Corridor			1.8900	1.4000	2.6460		(26)
External Wall	14.4300	3.2400	11.1900	0.1500	1.6785	60.0000	671.4000 (29a)
Wall onto Stairwell	16.3700	1.8900	14.4800	0.1342	1.9429	9.0000	130.3200 (29a)
Wall onto Roofspace	28.8200		28.8200	0.0800	2.3056	18.0000	518.7600 (29a)
Dormer Cheeks	3.8100	2.2300	1.5800	0.1800	0.2844	18.0000	28.4400 (29a)
Dormer Roof	1.8500		1.8500	0.1400	0.2590	9.0000	16.6500 (30)
Main Plane Roof	14.0400		14.0400	0.0952	1.3371	9.0000	126.3600 (30)
External Sloped Roof	21.6800		21.6800	0.1000	2.1680	9.0000	195.1200 (30)
Total net area of external elements Aum(A, m ²)			101.0000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		18.8849		(33)
Party Floor			40.6700			30.0000	1220.1000 (32d)
Party Ceiling			40.6700			30.0000	1220.1000 (32b)
Stud			43.8700			9.0000	394.8300 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		4522.0800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							111.1896 (35)
Thermal bridges (User defined value 0.089 * total exposed area)							8.9890 (36)
Total fabric heat loss						(33) + (36) =	27.8739 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	18.8705	18.7162	18.5650	17.8547	17.7218	17.1031	17.1031	16.9886	17.3414	17.7218	17.9906	18.2717 (38)
Heat transfer coeff	46.7443	46.5901	46.4388	45.7285	45.5957	44.9770	44.9770	44.8625	45.2153	45.5957	45.8645	46.1456 (39)
Average = Sum(39)m / 12 =												45.7279 (39)
HLP	1.1494	1.1456	1.1418	1.1244	1.1211	1.1059	1.1059	1.1031	1.1118	1.1211	1.1277	1.1346 (40)
HLP (average)												1.1244 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4243 (42)
Average daily hot water use (litres/day)												68.0261 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	74.8287	72.1076	69.3866	66.6655	63.9445	61.2235	61.2235	63.9445	66.6655	69.3866	72.1076	74.8287 (44)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy content (annual)	110.9688	97.0540	100.1510	87.3141	83.7799	72.2957	66.9926	76.8750	77.7931	90.6604	98.9629	107.4673 (45)
Distribution loss (46)m = 0.15 x (45)m	16.6453	14.5581	15.0227	13.0971	12.5670	10.8444	10.0489	11.5313	11.6690	13.5991	14.8444	16.1201 (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)
Total heat required for water heating calculated for each month	110.9688	97.0540	100.1510	87.3141	83.7799	72.2957	66.9926	76.8750	77.7931	90.6604	98.9629	107.4673 (62)
Solar input	0.0000	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	110.9688	97.0540	100.1510	87.3141	83.7799	72.2957	66.9926	76.8750	77.7931	90.6604	98.9629	107.4673 (64)
Heat gains from water heating, kWh/month	36.8971	32.2704	33.3002	29.0319	27.8568	24.0383	22.2750	25.5609	25.8662	30.1446	32.9052	35.7329 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	71.2128	71.2128	71.2128	71.2128	71.2128	71.2128	71.2128	71.2128	71.2128	71.2128	71.2128	71.2128 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	11.8892	10.5599	8.5879	6.5016	4.8600	4.1030	4.4335	5.7628	7.7348	9.8211	11.4626	12.2196 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	123.2221	124.5008	121.2786	114.4189	105.7599	97.6216	92.1847	90.9060	94.1282	100.9879	109.6469	117.7852 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.1213	30.1213	30.1213	30.1213	30.1213	30.1213	30.1213	30.1213	30.1213	30.1213	30.1213	30.1213 (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)	-56.9702	-56.9702	-56.9702	-56.9702	-56.9702	-56.9702	-56.9702	-56.9702	-56.9702	-56.9702	-56.9702	-56.9702 (71)
Water heating gains (Table 5)	49.5929	48.0215	44.7584	40.3221	37.4420	33.3866	29.9396	34.3561	35.9253	40.5169	45.7016	48.0281 (72)
Total internal gains	232.0680	230.4460	221.9886	208.6065	195.4257	182.4750	173.9215	178.3887	185.1521	198.6897	214.1750	225.3968 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
North					1.3500	10.6334	0.6300	0.7000			0.7700			4.3871 (74)
East					2.2300	19.6403	0.6300	0.7000			0.7700			13.3852 (76)
South					1.8900	46.7521	0.6300	0.7000			0.7700			27.0044 (78)
Solar gains	44.7767	78.7944	113.7045	149.4462	174.2511	175.7531	168.3141	149.5549	126.1311	88.7520	54.1112			37.9989 (83)
Total gains	276.8447	309.2404	335.6931	358.0527	369.6768	358.2281	342.2356	327.9436	311.2833	287.4416	268.2862			263.3956 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	26.8724	26.9614	27.0492	27.4693	27.5494	27.9283	27.9283	27.9997	27.7812	27.5494	27.3879	27.2211
alpha	2.7915	2.7974	2.8033	2.8313	2.8366	2.8619	2.8619	2.8666	2.8521	2.8366	2.8259	2.8147
util living area	0.9636	0.9490	0.9233	0.8732	0.7877	0.6555	0.5204	0.5551	0.7412	0.8885	0.9479	0.9678 (86)
MIT	18.8845	19.1178	19.5003	20.0011	20.4481	20.7786	20.9174	20.8983	20.6614	20.0909	19.4113	18.8477 (87)
Th 2	19.9607	19.9638	19.9668	19.9810	19.9836	19.9960	19.9960	19.9983	19.9912	19.9836	19.9783	19.9726 (88)
util rest of house	0.9578	0.9409	0.9106	0.8508	0.7472	0.5853	0.4206	0.4572	0.6803	0.8643	0.9383	0.9627 (89)
MIT 2	17.1456	17.4834	18.0346	18.7525	19.3662	19.7940	19.9422	19.9280	19.6579	18.8918	17.9203	17.0994 (90)
Living area fraction	18.0952	18.3760	18.8350	19.4344	19.9570	20.3317	20.4747	20.4579	20.2059	19.5466	18.7345	18.0542 (92)
MIT	18.0952	18.3760	18.8350	19.4344	19.9570	20.3317	20.4747	20.4579	20.2059	19.5466	18.7345	18.0542 (93)
Temperature adjustment												0.0000
adjusted MIT	18.0952	18.3760	18.8350	19.4344	19.9570	20.3317	20.4747	20.4579	20.2059	19.5466	18.7345	18.0542 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9439	0.9249	0.8935	0.8368	0.7461	0.6102	0.4701	0.5042	0.6945	0.8519	0.9232	0.9498 (94)
Ext temp.	261.3030	286.0195	299.9395	299.6202	275.8020	218.6080	160.8894	165.3454	216.1821	244.8800	247.6924	250.1818 (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	644.8482	627.8465	572.8229	481.7220	376.4850	257.7948	174.2745	182.0460	276.0806	407.9279	533.6123	639.3074 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating per m2	285.3577	229.7078	203.0252	131.1133	74.9081	0.0000	0.0000	0.0000	0.0000	121.3076	205.8623	289.5095 (98)
												1540.7916 (98)
												37.8852 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)

0.0000 (201)

Fraction of space heat from main system(s)

1.0000 (202)

Efficiency of main space heating system 1 (in %)

175.1000 (206)

Efficiency of secondary/supplementary heating system, %

0.0000 (208)

Space heating requirement

879.9495 (211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	285.3577	229.7078	203.0252	131.1133	74.9081	0.0000	0.0000	0.0000	0.0000	121.3076	205.8623	289.5095	(98)
Space heating efficiency (main heating system 1)	175.1000	175.1000	175.1000	175.1000	175.1000	0.0000	0.0000	0.0000	0.0000	175.1000	175.1000	175.1000	(210)
Space heating fuel (main heating system)	162.9684	131.1866	115.9482	74.8791	42.7802	0.0000	0.0000	0.0000	0.0000	69.2791	117.5684	165.3395	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	110.9688	97.0540	100.1510	87.3141	83.7799	72.2957	66.9926	76.8750	77.7931	90.6604	98.9629	107.4673	(64)
Efficiency of water heater (217)m	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	(216)
Fuel for water heating, kWh/month	63.3745	55.4277	57.1965	49.8653	47.8469	41.2882	38.2596	43.9035	44.4278	51.7764	56.5179	61.3748	(219)
Water heating fuel used												611.2592	(219)
Annual totals kWh/year													
Space heating fuel - main system												879.9495	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
Total electricity for the above, kWh/year												30.0000	(231)
Electricity for lighting (calculated in Appendix L)												209.9668	(232)
Total delivered energy for all uses												1731.1755	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	879.9495	0.5190	456.6938	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	611.2592	0.5190	317.2435	(264)
Space and water heating			773.9373	(265)
Pumps and fans	30.0000	0.5190	15.5700	(267)
Energy for lighting	209.9668	0.5190	108.9728	(268)
Total CO2, kg/year			898.4801	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			22.0900	(273)

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

DER		22.0900	ZC1
Total Floor Area	TFA	40.6700	
Assumed number of occupants	N	1.4243	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.9540	ZC2
CO2 emissions from cooking, equation (L16)		3.7665	ZC3
Total CO2 emissions		43.8104	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		43.8104	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	40.6700 (1b)	x 2.2200 (2b)	= 90.2874 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	40.6700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 90.2874 (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) = 0.2215 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4715 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.4008 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.5110	0.5010	0.4910	0.4409	0.4308	0.3807	0.3807	0.3707	0.4008	0.4308	0.4509	0.4709 (22b)
Effective ac	0.6306	0.6255	0.6205	0.5972	0.5928	0.5725	0.5725	0.5687	0.5803	0.5928	0.6016	0.6109 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			5.4700	1.3258	7.2519		(27)
External Wall	14.4300	3.2400	11.1900	0.1800	2.0142		(29a)
Wall onto Stairwell	16.3700	1.8900	14.4800	0.1800	2.6064		(29a)
Wall onto Roofspace	28.8200		28.8200	0.1800	5.1876		(29a)
Dormer Cheeks	3.8100	2.2300	1.5800	0.1800	0.2844		(29a)
Dormer Roof	1.8500		1.8500	0.1300	0.2405		(30)
Main Plane Roof	14.0400		14.0400	0.1300	1.8252		(30)
External Sloped Roof	21.6800		21.6800	0.1300	2.8184		(30)
Total net area of external elements Aum(A, m ²)			101.0000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	24.1186		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.1129 (36)
Total fabric heat loss						(33) + (36) =	32.2315 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	18.7875	18.6365	18.4884	17.7929	17.6628	17.0571	17.0571	16.9449	17.2904	17.6628	17.9260	18.2012 (38)
Heat transfer coeff	51.0190	50.8680	50.7199	50.0244	49.8943	49.2886	49.2886	49.1764	49.5219	49.8943	50.1575	50.4327 (39)
Average = Sum(39)m / 12 =												50.0238 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2545	1.2507	1.2471	1.2300	1.2268	1.2119	1.2119	1.2092	1.2177	1.2268	1.2333	1.2400 (40)
HLP (average)												1.2300 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4243 (42)
Average daily hot water use (litres/day)												68.0261 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	74.8287	72.1076	69.3866	66.6655	63.9445	61.2235	61.2235	63.9445	66.6655	69.3866	72.1076	74.8287 (44)
Energy conte	110.9688	97.0540	100.1510	87.3141	83.7799	72.2957	66.9926	76.8750	77.7931	90.6604	98.9629	107.4673 (45)
Energy content (annual)												Total = Sum(45)m = 1070.3149 (45)
Distribution loss (46)m = 0.15 x (45)m	16.6453	14.5581	15.0227	13.0971	12.5670	10.8444	10.0489	11.5313	11.6690	13.5991	14.8444	16.1201 (46)
Water storage loss:												

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														150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):									1.3938	(48)					
Temperature factor from Table 2b									0.5400	(49)					
Enter (49) or (54) in (55)									0.7527	(55)					
Total storage loss															
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	(56)	
If cylinder contains dedicated solar storage															
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	(57)	
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	(59)	
Total heat required for water heating calculated for each month															
Solar input	157.5637	139.1397	146.7459	132.4059	130.3748	117.3876	113.5875	123.4699	122.8850	137.2553	144.0548	154.0622	(62)		
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)		
									Solar input (sum of months) = Sum(63)m =				0.0000	(63)	
Output from w/h															
	157.5637	139.1397	146.7459	132.4059	130.3748	117.3876	113.5875	123.4699	122.8850	137.2553	144.0548	154.0622	(64)		
									Total per year (kWh/year) = Sum(64)m =				1618.9323	(64)	
Heat gains from water heating, kWh/month															
	74.1730	65.9390	70.5761	65.1054	65.1328	60.1118	59.5510	62.8369	61.9397	67.4205	68.9786	73.0088	(65)		

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9888	0.9818	0.9660	0.9256	0.8345	0.6618	0.4814	0.5203	0.7617	0.9320	0.9795	0.9907 (94)
Useful gains	323.2874	352.7991	372.6815	377.7940	350.3179	270.2436	188.8551	196.6855	275.2683	314.6062	311.8558	310.5677 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	756.5266	732.5789	663.8306	553.4764	427.7976	288.5457	192.0371	201.2886	311.9420	470.3200	623.1686	751.7363 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	322.3299	255.2120	216.6149	126.4913	57.6449	0.0000	0.0000	0.0000	0.0000	115.8510	224.1452	328.2294 (98)
Space heating												1646.5188 (98)
Space heating per m2												40.4848 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)

0.0000 (201)

Fraction of space heat from main system(s)

1.0000 (202)

Efficiency of main space heating system 1 (in %)

93.5000 (206)

Efficiency of secondary/supplementary heating system, %

0.0000 (208)

Space heating requirement

1760.9826 (211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	322.3299	255.2120	216.6149	126.4913	57.6449	0.0000	0.0000	0.0000	0.0000	115.8510	224.1452	328.2294	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	344.7379	272.9541	231.6737	135.2849	61.6523	0.0000	0.0000	0.0000	0.0000	123.9048	239.7275	351.0475	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	157.5637	139.1397	146.7459	132.4059	130.3748	117.3876	113.5875	123.4699	122.8850	137.2553	144.0548	154.0622	(64)
Efficiency of water heater (217)m	86.6838	86.4119	85.8511	84.6923	82.8014	79.8000	79.8000	79.8000	79.8000	84.3656	85.9891	86.7829	(216)
Fuel for water heating, kWh/month	181.7683	161.0191	170.9308	156.3376	157.4548	147.1022	142.3402	154.7242	153.9912	162.6911	167.5269	177.5260	(219)
Water heating fuel used												1933.4124	(219)
Annual totals kWh/year													
Space heating fuel - main system												1760.9826	(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)

209.9668 (232)

Total delivered energy for all uses

3979.3619 (238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1760.9826	0.2160	380.3723	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1933.4124	0.2160	417.6171	(264)
Space and water heating			797.9893	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	209.9668	0.5190	108.9728	(268)
Total CO2, kg/m2/year			945.8871	(272)
Emissions per m2 for space and water heating			19.6211	(272a)
Fuel factor (electricity)			1.5500	
Emissions per m2 for lighting			2.6794	(272b)
Emissions per m2 for pumps and fans			0.9571	(272c)
Target Carbon Dioxide Emission Rate (TER) = (19.6211 * 1.55) + 2.6794 + 0.9571, rounded to 2 d.p.			34.0500	(273)

Appendix C

Water Use Calculations





Job no:

Date: 19/04/2022

Assessor name: Tom Reynolds

Registration no:

Development name: 233 London Road

Issue Date:

Rainwater

Greywater Results

WATER EFFICIENCY CALCULATOR FOR NEW DWELLINGS

(for use with the Code for Sustainable Homes issues Wat 1 for the May 2009 and subsequent versions)

Dwelling Description 1B 2P Duplex

1st step - Select from options below:

Is a Rain and/or Greywater system specified?	No
Is a shower AND bath present?	Yes
Has a washing machine been specified?	No
Has a dishwasher been specified?	No

2nd step - Build spreadsheet (click button below)

BUILD SPREADSHEET

As soon as this button is pressed the spreadsheet will change according to the options selected previously in the 1st step. Scroll down to see the changes.

3rd step - Enter consumption details for the specified fittings

TAPS (excluding kitchen taps)		Fitting type	Flow rate (litres/min)	Number of fittings
	1	Basin Taps	4.00	2
	2			
	3			
	4			
	Proportionate flow rate (litres/min)			2.80
	Consumption / person / day (Litres)			7.90

BATHS		Fitting type	Capacity to overflow (litres)	Number of fittings
	1	Bath	170.00	1
	2			
	3			
	4			
	Proportionate capacity to overflow (litres)			119.00
		Consumption / person / day (Litres)		18.70
SHOWERS		Fitting type	Flow rate (litres/min)	Number of fittings
	1	Shower	9.00	1
	2			
	3			
	4			
	Proportionate flow rate (litres/min)			6.30
		Consumption / person / day (Litres)		39.33
DISHWASHER				
Where no dishwasher is specified, a default consumption figure of 1.25 litres per place setting is used.				
		Consumption / person / day (Litres)		4.50

WASHING MACHINES				Number of fittings
Where no washing machine is specified, a default consumption figure of 8.17 litres per kilogram of dry load is used.				
Where no washing machines have been specified but plumbing for future supply of grey/rainwater was installed, please enter details:				
		Consumption / person / day (Litres)	17.16	

WC's	Fitting Type	Flush Type	Volume**	Number of fittings
1	WC	Full Flush	4.00	2
		Part Flush	2.60	
2		Full Flush		
		Part Flush		
3		Full Flush		
		Part Flush		
4		Full Flush		
		Part Flush		
		Average effective flushing volume (litres)		3.06
		Consumption / person / day (Litres)		13.53

KITCHEN SINK TAPS		Fitting Type	Flow rate (litres/minute)	Number of fittings
	1	Kitchen Tap	8.00	1
	2			
	3			
	4			
		Proportionate flow rate (litres/min)		5.60
		Consumption / person / day (Litres)		13.88

WASTE DISPOSAL UNIT		
Is a waste disposal unit specified for the dwelling?		No
	Consumption / person / day (Litres)	0.00

WATER SOFTENER		
Water Softener in use?		No
Total capacity used per regeneration (%)		
Water consumed per regeneration (litres)		
Average number of regeneration cycles per day (No.)		
Number of occupants served by the system (No.)		
Water consumed beyond 4% person / day (Litres)		0.00

4th step - Analyse Results[Go to Start](#)**INTERNAL WATER CONSUMPTION**

NET INTERNAL WATER CONSUMPTION	(litres/person/day)	115.00
RAINWATER ONLY COLLECTION SAVING	(litres/person/day)	0.00
GREYWATER ONLY RECYCLING SAVING	(litres/person/day)	0.00
RAIN/GREYWATER COLLECTION SAVING (combined system)	(litres/person/day)	0.00
NORMALISATION FACTOR	(litres/person/day)	0.91
TOTAL WATER CONSUMPTION	(litres/person/day)	104.7
CSH CREDITS ACHIEVED		3
CSH MANDATORY LEVEL:		Level 3/4

17. K COMPLIANCE

EXTERNAL WATER USE	(litres / person / day)	5.00
TOTAL WATER CONSUMPTION	(litres / person / day)	109.7
17. K COMPLIANCE?		Yes

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Job no:

Date: 19/04/2022

Assessor name: Tom Reynolds

Registration no:

Development name: 233 London Road

Issue Date:

Rainwater

Greywater Results

WATER EFFICIENCY CALCULATOR FOR NEW DWELLINGS

(for use with the Code for Sustainable Homes issues Wat 1 for the May 2009 and subsequent versions)

Dwelling Description 1B1P & 2B4P

1st step - Select from options below:

Is a Rain and/or Greywater system specified?	No
Is a shower AND bath present?	Yes
Has a washing machine been specified?	No
Has a dishwasher been specified?	No

2nd step - Build spreadsheet (click button below)

[BUILD SPREADSHEET](#)

As soon as this button is pressed the spreadsheet will change according to the options selected previously in the 1st step. Scroll down to see the changes.

3rd step - Enter consumption details for the specified fittings

TAPS (excluding kitchen taps)		Fitting type	Flow rate (litres/min)	Number of fittings
	1	Basin Taps	4.00	1
	2			
	3			
	4			
	Proportionate flow rate (litres/min)			2.80
	Consumption / person / day (Litres)			7.90

BATHS		Fitting type	Capacity to overflow (litres)	Number of fittings
	1	Bath	170.00	1
	2			
	3			
	4			
	Proportionate capacity to overflow (litres)			119.00
		Consumption / person / day (Litres)		18.70

SHOWERS		Fitting type	Flow rate (litres/min)	Number of fittings
	1	Showers	9.00	1
	2			
	3			
	4			
	Proportionate flow rate (litres/min)			6.30
		Consumption / person / day (Litres)		39.33

DISHWASHER		
Where no dishwasher is specified, a default consumption figure of 1.25 litres per place setting is used.		
		Consumption / person / day (Litres)
		4.50

WASHING MACHINES				Number of fittings
Where no washing machine is specified, a default consumption figure of 8.17 litres per kilogram of dry load is used.				
Where no washing machines have been specified but plumbing for future supply of grey/rainwater was installed, please enter details:				
		Consumption / person / day (Litres)	17.16	
WC's	Fitting Type	Flush Type	Volume**	Number of fittings
1	WCs	Full Flush	4.00	1
		Part Flush	2.60	
2		Full Flush		
		Part Flush		
3		Full Flush		
		Part Flush		
4		Full Flush		
		Part Flush		
		Average effective flushing volume (litres)		3.06
		Consumption / person / day (Litres)	13.53	

KITCHEN SINK TAPS		Fitting Type	Flow rate (litres/minute)	Number of fittings
	1	Kitchen Taps	8.00	1
	2			
	3			
	4			
		Proportionate flow rate (litres/min)		5.60
		Consumption / person / day (Litres)		13.88

WASTE DISPOSAL UNIT		
Is a waste disposal unit specified for the dwelling?		No
	Consumption / person / day (Litres)	0.00

WATER SOFTENER		
Water Softener in use?		No
Total capacity used per regeneration (%)		
Water consumed per regeneration (litres)		
Average number of regeneration cycles per day (No.)		
Number of occupants served by the system (No.)		
Water consumed beyond 4% person / day (Litres)		0.00

4th step - Analyse Results[Go to Start](#)**INTERNAL WATER CONSUMPTION**

NET INTERNAL WATER CONSUMPTION	(litres/person/day)	115.00
RAINWATER ONLY COLLECTION SAVING	(litres/person/day)	0.00
GREYWATER ONLY RECYCLING SAVING	(litres/person/day)	0.00
RAIN/GREYWATER COLLECTION SAVING (combined system)	(litres/person/day)	0.00
NORMALISATION FACTOR	(litres/person/day)	0.91
TOTAL WATER CONSUMPTION	(litres/person/day)	104.7
CSH CREDITS ACHIEVED		3
CSH MANDATORY LEVEL:		Level 3/4

17. K COMPLIANCE

EXTERNAL WATER USE	(litres / person / day)	5.00
TOTAL WATER CONSUMPTION	(litres / person / day)	109.7
17. K COMPLIANCE?		Yes

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