



ENERGY STRATEGY

Elgar Road, Reading

REPORT STATUS: 1.0



Document Control Sheet

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About Sadler Energy and Environmental Services Ltd.

Our team of technical specialists offer advanced levels of expertise and experience to our clients. We have a wide experience of the construction and development industry from the concept and planning stage through to the completion of the project.

Our emphasis is to provide innovative and cost-effective solutions that respond to increasing demands for energy efficiency, quality and practical on-site applications.

Table of Contents

Document Control Sheet	2
About Sadler Energy and Environmental Services Ltd	2
1. Executive Summary.....	4
2. Information and Background	5
2.1 Planning Targets	6
3. Energy Efficiency – Demand Reduction	7
3.1 Methodology	7
3.2 Building Energy Modelling.....	7
3.3 Energy Efficiency	7
3.4 Thermal Envelope.....	8
3.5 Thermal Bridging	8
3.6 Uncontrolled Air Leakage	9
3.7 Lighting	9
3.8 Primary Energy	10
3.9 Passive Design Measures and Overheating Risk Mitigation	10
3.10 Waste Management	11
4. Energy Efficiency Low and Zero Carbon (LZC) Energy Generation and Results	13
4.1 Heat Pump Hot Water Cylinder	15
4.2 Photovoltaic Panels	15
4.2.1 Summary of PV	16
5. Energy and CO ₂ Savings.....	18
5.1 CO ₂ Emission Sitewide Savings	18
6. Conclusion.....	19

1. Executive Summary

This energy strategy supports the proposed residential development at 220 Elgar Road South, Reading RG2 0BW, which comprises 16 new flats within a three-storey building, located within the jurisdiction of Reading Borough Council. The scheme is being brought forward following a planning appeal (Ref: APP/E0345/W/23/3315618), where the Planning Inspectorate identified specific conditions to be satisfied for approval.

Among these, a key condition relates to the sustainability performance of the development:

‘A minimum 35% improvement in the Dwelling Emission Rate (DER) over the Target Emission Rate (TER), as defined in Approved Document L1A of the Building Regulations (2013 edition).’

In response, this revised energy strategy adopts a fabric-first approach combined with high-efficiency systems to not only meet but significantly exceed the stated requirement.

Key Energy and Sustainability Features:

🌱 High-performance electric systems including:

- Electric radiant panel heating
- Heat pump hot water cylinders
- Mechanical Ventilation with Heat Recovery (MVHR)

🌱 These measures deliver a 73.89% reduction in carbon emissions against the Part L 2012 baseline, far surpassing the required 35% threshold.

🌱 No communal heating network is proposed, minimising the risk of internal overheating and ensuring compliance with Approved Document O.

🌱 Integrated PV generation, paired with electric heating, enhances long-term energy performance and supports decarbonisation objectives.

🌱 A commitment to broader environmental goals through:

- A hierarchical overheating mitigation strategy.
- Water-efficient fittings to reduce internal water consumption below regulatory targets.
- Construction and post-occupancy waste management protocols.

This strategy positions the development as a forward-thinking, low-carbon scheme that aligns with national and local sustainability objectives. By exceeding regulatory benchmarks and meeting the conditions set out by the appeal decision, the proposed energy and environmental measures demonstrate a robust commitment to resilient, energy-efficient, and future-proofed residential design.

2. Information and Background

This energy strategy has been prepared to demonstrate how the proposed development will exceed the sustainability and environmental performance standards outlined in the Planning Inspectorate’s Appeal Decision (Ref: APP/E0345/W/23/3315618). It presents the core technologies and design principles that will enable the scheme to not only meet, but surpass, the prescribed planning requirements—while actively supporting the wider transition to a low-carbon, fossil fuel-free future.

The primary objective of this strategy is to ensure full compliance with the sustainability condition of the appeal decision, while significantly lowering the carbon footprint of the development. In doing so, it contributes to local and national efforts to address climate change and aligns with the UK’s broader decarbonisation goals.

By incorporating high-performance building fabric, energy-efficient systems, and on-site renewable energy generation, the strategy sets out a well-defined pathway for achieving and exceeding local environmental targets. The approach considers long-term resilience and operational efficiency, with particular attention given to fabric-first principles, future-ready energy infrastructure, and effective renewable integration.

This development aspires to serve as a model for sustainable residential design within Reading, illustrating how thoughtful planning and the deployment of low-carbon technologies can deliver enduring environmental, social, and economic value.



Image 1: Site Plan

2.1 Planning Targets

The Planning Inspectorate's Appeal Decision (Ref: APP/E0345/W/23/3315618) sets out specific targets and conditions that must be met as part of the planning approval for this development. The key requirements relating to sustainable development are outlined as follows:

APP/E0345/W/23/3315618

Sustainability Requirements

- No dwelling hereby approved shall be occupied until verification shall be submitted to and approved in writing by the Local Planning Authority demonstrating that all of the dwellings hereby permitted have achieved a minimum of a 35% improvement in the dwelling emission rate over the target emission rate, as defined in The Building Regulations for England Approved Document L1a: Conservation of Fuel and Power in New Dwellings (2013 edition). The written verification shall be in the form of an 'As Built' Standard Assessment Procedure (SAP) assessment, produced by an accredited energy assessor.

3. Energy Efficiency – Demand Reduction

Energy efficiency and carbon emission rates have been calculated using SAP 2012, which produces metrics used for Building Regulations compliance, based on the predicted annual energy use per square meter of floor area for a dwelling. The metrics used in this report are:

- 🌱 Dwelling Emissions Rate (DER): the predicted carbon dioxide emissions based on the fuels used to heat, light, cool and ventilate a dwelling, expressed in kgCO₂/m²/yr.
- 🌱 Dwelling Fabric Energy Efficiency: the predicted energy used to heat and cool a dwelling expressed in kWh/m²/yr.

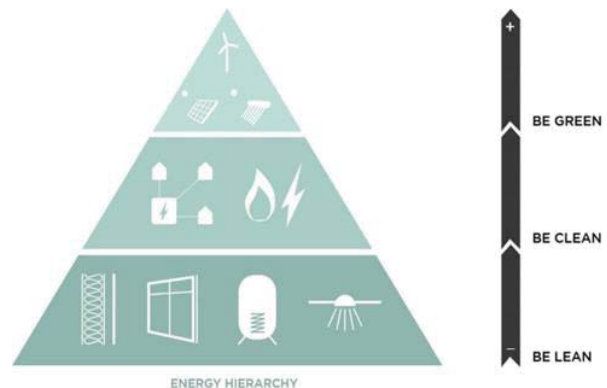
For each metric, a “target” is calculated by SAP based on a notional dwelling specification set in the Building Regulations. The dwelling energy metrics must be lower than these targets to achieve Building Regulation Part L compliance.

This energy strategy will outline carbon emission savings through fabric-first approaches and renewable technology options, with the aim to achieve low and zero carbon dwellings. Each option will be modelled in SAP and produce percentage savings on dwelling emission rates (DER) for properties vs target emission rates (TER).

3.1 Methodology

This report uses the energy hierarchy to minimise onsite carbon emissions, the stages are:

- 🌱 Use Renewable Energy - assess the feasibility of renewable energy systems.
- 🌱 Supply Energy Efficiently – use low-carbon technology to significantly reduce energy consumption.
- 🌱 Use Less Energy – the incorporation of low energy design and passive measures to promise the reduction of energy use.



3.2 Building Energy Modelling

The site has been modelled using SAP 2012 calculations to assess predicted energy demand and carbon emissions, in line with the requirements set out in Appeal Decision APP/E0345/W/23/3315618. For formal Building Regulations compliance, the development will be registered under SAP 2021, ensuring alignment with the most up-to-date energy performance standards.

3.3 Energy Efficiency

To deliver the energy demand reduction required to meet and exceed Part L 2012 compliance, improvements to the fabric specification and heating systems of the dwellings forms the first stage of the energy hierarchy.

A fabric first approach has been adopted to minimise energy demand as much as practical. Energy efficiency features that were proposed include: Built form, Insulation standards, Glazing, Heating systems, Ventilation, Lighting, Controls,

Heat recovery, Free cooling, and Equipment. In this chapter we have detailed the most effective energy efficient measures.

Three main sources of heat loss:

-  Thermal Envelope
-  Thermal Bridging
-  Uncontrolled Air Leakage

3.4 Thermal Envelope

The dwellings on this development aim for fabric efficiency well above Part L standards, see Table 1.

Thermal Element	BR U-value (Part L 2021) W/m ² K	BR U-value (Part L 2021) W/m ² K	Proposed Design U-values W/m ² K
Ground Floors	0.25	0.18	0.11
Exposed Floors	0.25	0.18	0.11
External wall	0.30	0.26	0.15
Flat Roof / Pitched Roof (insulation at rafter level)	0.20	0.16	0.14
External Doors	2.0	1.6	1.0
Windows & Glazed Doors	2.0	1.6	1.2

Table 1 – Proposed Fabric Standard

3.5 Thermal Bridging

Thermal bridging occurs at the junction between fabric elements, where the continuous insulation line is broken. Through careful detailing of junctions, it is possible to mitigate against the impact of thermal bridges.

The developments standard details ensure that the design of junctions minimises unnecessary bridging of the insulation layers, with avoidable heat loss being reduced wherever possible. Accurate calculation of these heat losses forms an integral part of the SAP calculations undertaken to establish energy consumption of the dwellings, and as such thermal modelling has been undertaken to assess the performance of all main building junctions.

The dwellings on this development aim for minimal thermal bridging, with thermal bridging for all blocks well below Building Regulations, see Table 2.

THERMAL BRIDGING		
Non-repeating junctions have been designed and built to the following details:		
	Recognised construction details	Default
E2 Other Lintels	MFF-150-E2-02 Psi 0.028	
E3 Sill	MFF-150-E3-01 Psi 0.024	
E4 Jamb	MFF-150-E4-01 Psi 0.019	
E5 Ground floor	MFF-150-E5-02 Psi 0.060	

E20 Exposed floor	MFF-150-E20-01 Psi 0.054	
E6 Intermediate floor between dwellings	MFF-150-E6-01 Psi 0.000	
E7 Party floor between dwellings	MFF-150-E7-01 Psi 0.036	
E23 Balcony within/between dwellings, balcony support penetrate insulation		x
E10 Eaves (insulation at ceiling)		x
E11 Eaves (insulation a rafter)	MFF-150-E11-02 Psi 0.017	
E12 Gable (insulation at ceiling)		
E13 Gable (insulation at rafter)	MFF-150-E13-01 Psi 0.044	
E14 Flat roof		
E15 Flat roof with parapet		x
E16 Corner	MFF-150-E16-01 Psi 0.037	x
E17 Corner (Inverted)	MFF-150-E17-01 Psi -0.079	
E18 Party wall between dwellings	MFF-150-E18-03 Psi 0.041	
E25 Staggered Party wall	MFF-150-E25-03 Psi 0.030	
P1 Party wall to ground floor	MFF-150-MPW-03 Psi 0.058	
P2 Party wall to intermediate floor within dwelling		x
P3 Party wall to intermediate floor between dwellings		x
P4 Party wall to insulation at ceiling level	MFF-150-MPW-01 Psi 0.033	

Table 2 – Thermal Bridging

3.6 Uncontrolled Air Leakage

As buildings become increasingly well insulated, uncontrolled air leakage accounts for a larger proportion of overall heat loss. It is therefore essential to minimise unintended air infiltration to maintain energy efficiency and thermal performance.

Table 3 presents the air permeability targets for all dwellings within the Elgar Road development.

In accordance with Building Regulations (Approved Document L1A, 2013 – SAP 2012), the maximum allowable air permeability for new dwellings is $10 \text{ m}^3/\text{h} \cdot \text{m}^2 @ 50 \text{ Pa}$. However, the Elgar Road development is designed to achieve significantly lower permeability rates, outperforming both the SAP 2012 limiting value and the updated SAP 2021 standard of $8 \text{ m}^3/\text{h} \cdot \text{m}^2 @ 50 \text{ Pa}$, as illustrated in Table 3.

Building	Air Permeability $\text{m}^3/\text{hm}^2 @ 50 \text{ Pa}$
Dwellings	4

Table 3 – Air Permeability

3.7 Lighting

Low energy fittings are defined as fittings that can only be used with lamps having a luminous efficacy greater than 100 lumens per circuit watt. All buildings will have 100% low energy lights fitted internally.

3.8 Primary Energy

The heating and energy systems in this development are designed to provide residents with a high level of control, encouraging energy-efficient usage and reducing unnecessary energy consumption.

Each apartment will feature a dedicated air source heat pump cylinder paired with electric heating, allowing for room-by-room zone control. This means residents can adjust the temperature in individual rooms rather than heating the entire apartment, enhancing both efficiency and comfort.

Additionally, solar photovoltaic (PV) panels will be installed on the rooftops, generating renewable electricity to reduce reliance on the grid and support the developments sustainability objectives. Further details on the PV systems can be found in Section 4 of this report.

By integrating zoned heating control and on-site renewable energy, this strategy minimises energy waste, lowers residents' energy bills, and contributes to a more sustainable, environmentally responsible development.

3.9 Passive Design Measures and Overheating Risk Mitigation

To help reduce energy demand, the dwellings have been designed using passive design principles wherever practical. This includes carefully considering the building orientation and site layout to maximise sunlight during colder months (solar gain).

The use of materials with high thermal mass, such as traditional masonry, helps regulate indoor temperatures. These materials take longer to heat up during the day, acting as a “heat sink” by absorbing excess heat and reducing the risk of overheating. At night, they slowly release the stored heat, providing a small amount of passive heating. This process smooths temperature fluctuations, reducing the need for instant heating or cooling.

Additional passive and active measures to reduce energy demand and balance heat gains include:

-  Solar control glazing: Glazing with a solar transmittance value (g-value) of 0.30–0.45 has been specified. This balances winter solar gain with limiting summer heat buildup, as determined in the Part O overheating assessment.
-  Minimising overshadowing: The design reduces shading from nearby buildings and trees to maximise natural light.
-  Efficient hot water systems: Where required, highly insulated hot water cylinders with low heat loss values are specified, along with fully insulated pipework.
-  Energy-efficient lighting: All lighting installed will meet or exceed a minimum efficiency of 100 lumens per watt.

The development uses a mix of passive and purge ventilation strategies, depending on the house or block design. In some areas near the railway line, acoustic concerns mean certain windows cannot be opened, so mechanical ventilation will be installed to cool the buildings effectively. These strategies ensure that active cooling systems, like air conditioning, are not needed.

By incorporating these measures, the development is designed to be more resilient to climate change while minimising the risk of overheating. This is especially important as homes become more insulated and airtight to meet energy efficiency standards.

3.10 Waste Management

The developer is dedicated to the implementation of efficient waste management practices on the construction site, in accordance with the WRAP principles. They have formulated a Site Waste Management Plan (SWMP), and the developer is aiming to achieve significant waste reduction and maximise the reusing of materials on-site.

The developer has made a firm commitment to recycling a minimum of 80% of the waste generated on the site. To achieve this goal, the following measures have been incorporated:

1. Segregation: Waste materials will be segregated at the source to facilitate effective recycling and reduce contamination.
2. On-site Recycling Facilities: Adequate recycling facilities will be provided on-site to enable the sorting and processing of recyclable materials.
3. Material Reuse: Whenever feasible, materials will be reused on-site to minimise waste generation.
4. Supplier Engagement: Suppliers will be encouraged to adopt sustainable packaging and waste management practices to minimise waste generation.
5. Monitoring and Reporting: The waste management processes will be regularly monitored, and progress towards the recycling target will be documented and reported.



4. Energy Efficiency Low and Zero Carbon (LZC) Energy Generation and Results

The energy hierarchy requires that the feasibility of on-site renewables technology be investigated. This section reviews each of the technologies that are to be considered on a new development, with the most feasible method being selected.

Technology	Checklist	Comments	Suitable Technology
Solar Photovoltaic 	Will the buildings have an east to west (through south) facing roof or flat roof?	Building has a flat roof hence orientation will not be an issue.	Suitable
	Are roofs free from overshadowing for most of the day from buildings or other structures?	Surrounding dwelling heights do not exceed the height of the proposed dwellings. Sufficient distance from the existing established trees which are to be retained.	
	Is the building in a conservation area?	No	
Solar thermal 	Will the buildings have a year-round demand for hot water?	Yes	Solar hot water systems are not suitable for apartments due to the limited roof space, which cannot accommodate enough solar collectors to serve multiple dwellings.
	Will the buildings have an open aspect south east to south west facing roof of at least 4m²?	As the development mainly consists of apartments, there is not enough roof space to provide hot water via solar thermal for all the flats.	
	Is there space for hot water cylinder near the panels?		
	Is the building in a conservation area?	No	
Biomass 	Is there a local supply and space for storage of biomass fuel or can one be set up?	Storage space is likely to be an issue mainly due to the size of the development. For residential developments, a biomass boiler system is generally more viable for developments with at least 50-100 units. Smaller developments may not generate sufficient heat demand to justify the investment in a biomass boiler system.	Unsuitable
	Is a room heater or boiler required	A boiler room is provided, but it will need to be larger to accommodate the storage of biomass fuel, such as wood pellets or chips. Additionally, the storage space must be accessible for delivery vehicles.	
CHP 	Is a communal heat network proposed?	There is no district system available/proposed.	Unsuitable
Ground Source Heating 	Will there be room for a horizontal buried pipe?	Require a substantial amount of land for the installation of horizontal ground loops. This can be a constraint in urban or densely populated areas where space is limited.	Not considered within this report Due to the existing risk of overheating within the development—and the nature of the scheme as a block of flats—the use of a communal GSHP system for space heating is not recommended. Such systems typically require extensive internal pipework and centralised plant, which can contribute to increased internal heat
	Is the ground suitable for vertical pipe system?	Further assessment of ground conditions required. Local regulations may restrict drilling or excavation needed for GSHP installations. Permits may be required.	

			gains, particularly in circulation areas and apartments, thereby exacerbating overheating risks.
Air Source 	Is there sufficient room within the dwelling to accommodate internal unit. Is a low temperature heat emitter (i.e. underfloor heating) proposed? Other problems?	The installation of external ASHP units presents significant challenges in this development. If required, careful consideration would need to be given to their placement—either mounted on the building's exterior façade or positioned on a suitably sized flat roof area. In either case, appropriate access provisions must be incorporated into the design to ensure safe installation and ongoing maintenance, while also addressing potential visual and acoustic impacts. No, radiators are currently proposed, oversized radiators required to maintain heat output with low flow temperatures Due to the existing risk of overheating within the development—and the nature of the scheme as a block of flats—the use of a communal air source heat pump (ASHP) system for space heating is not recommended. Such systems typically require extensive internal pipework and centralised plant, which can contribute to increased internal heat gains, particularly in circulation areas and apartments, thereby exacerbating overheating risks.	Yes, the inclusion of ASHP hot water cylinders is considered appropriate and has been incorporated into the proposed energy strategy. These systems allow for efficient domestic hot water provision at the individual unit level, without the overheating implications associated with communal ASHP heating infrastructure.
District Heating 	Is there district heating situated close the site.	Currently there is no district heating or cooling systems	Unsuitable

4.1 Heat Pump Hot Water Cylinder

Heat pump water heaters are a relatively new and highly efficient way to provide stored hot water in homes and apartment buildings. They work using the same technology as an air source heat pump, absorbing energy from the external air and increasing its temperature through a vapour compression cycle. This process allows them to produce more heat output than the electrical energy they consume.

For example, a typical heat pump water heater can achieve a Coefficient of Performance (CoP) of 3, meaning that for every 1kW of electricity used, it generates 3kW of heat output. This makes them significantly more energy-efficient and cost-effective than traditional hot water cylinders that rely on immersion heaters. Systems like the Dimplex Edel offer a practical and efficient alternative, helping to reduce energy bills while providing reliable hot water.



One of the key advantages of these systems is their minimal installation requirements. They only need:

- 🌿 A standard electrical connection
- 🌿 Two small ducts leading to an external wall for air intake and exhaust
- 🌿 A storage space similar in size to a traditional hot water cylinder

Proper placement of the ducts is important to ensure they comply with ventilation and clearance regulations, avoiding interference with windows, vents, or other service penetrations.

For apartment buildings, installing individual air source heat pump cylinders in each unit offers several key benefits:

- 🌿 Eliminates the need for a centralised hot water system, reducing complexity and maintenance costs.
- 🌿 Removes communal heating pipework in corridors, which is a common cause of overheating in apartment blocks. This helps improve comfort levels and reduces the need for additional cooling solutions.
- 🌿 Reduces energy waste, as heat is generated and used at the point of demand rather than being distributed through long pipe runs.
- 🌿 Supports future energy efficiency goals, as these systems work well with renewable electricity sources, making them a more sustainable option.

With these benefits in mind, the proposal includes installing individual air source heat pump cylinders in each apartment, alongside electric heating. The energy performance and impact of this approach are detailed in Section 5 of this report.

4.2 Photovoltaic Panels

Photovoltaic (PV) panels generate electricity by converting daylight into energy. They do not need direct sunlight to function, making them well-suited to the UK's cloudy climate. However, they produce more electricity when exposed to direct sunlight, and their efficiency drops in heavily shaded areas.

The performance of a PV system depends on several factors, including the orientation of the building, roof angle, and weather conditions. South-facing roofs at an optimal tilt will generate the most electricity.



One limitation of PV panels is that they generate the most electricity during the daytime, which may not align with the peak energy demand of homes, typically in the morning and evening. Without a battery storage system, excess electricity produced during the day is exported to the grid rather than stored for later use. This is being considered by the developer further.

A total 10.7 kWp solar PV system has been proposed for the development. This capacity is sufficient to offset a significant proportion of emissions associated with fossil fuel use. When combined with heat pump hot water cylinders and a fabric-first design approach, the strategy positions each home on a strong pathway toward net-zero carbon emissions and supports the wider goal of environmental decarbonisation.

Solar Photovoltaic	
Potential Advantages	Risks & Disadvantages
- The technology offsets the high carbon content of grid supplied electricity used for lighting, pumps and fans, appliances, and equipment - Mature and well proven technology that is relatively easily integrated into building fabric - Solar resource is not limited by energy loads of the dwelling as any excess generation can be transferred to the national grid - PV systems generally require very little maintenance - Significantly lower emissions when calculated using updated SAP 10.1 emissions factors	- Poor design and installation can lead to lower-than-expected yields (e.g., from shaded locations) - Installation is restricted to favorable orientations - Occupiers may not benefit from Feed in Tariff payments where the contract is held by a landlord - Safe access must be considered for maintenance and service checks - Visual impact may be a concern in special landscape designations (e.g., AONB) - Reflected light may be a concern in some locations
Conclusion	
PV panels are considered technically feasible and should be positioned to make use of favourable roof orientations to maximise energy generation.	

4.2.1 Summary of PV

The development has been designed with consideration for the proposed fabric specification to achieve the required energy performance:

	Total PV (kWp)
All Dwellings	10.7

Table 4 – PV Summary

The proposed solar PV system will be distributed across the development to ensure that each dwelling directly benefits from the energy generated. This may be achieved through either a SolShare system—which enables shared solar

distribution with individual billing—or via dedicated inverters connected directly to each apartment. In both cases, the system will ensure that each unit is individually metered, allowing residents to make direct use of the electricity generated by the solar panels on their own energy accounts.

5. Energy and CO₂ Savings

The energy performance and associated carbon emissions of all dwellings within this development have been assessed in line with SAP 2012 methodology, ensuring compliance with the latest Part L 2012 Building Regulations. As part of this assessment, comprehensive SAP calculations have been undertaken for each dwelling type included in the scheme.

To determine compliance, we calculated the Target Emission Rate (TER) for each unit and compared it to the Dwelling Emission Rate (DER) following the integration of energy-efficient measures. The resulting percentage improvement illustrates the effectiveness of the selected technologies in reducing emissions.

The development adopts a low-carbon strategy, integrating renewable technologies such as heat pump water cylinders and a roof-mounted photovoltaic (PV) system. These measures collectively contribute to reducing regulated energy consumption, lowering carbon output, and enhancing overall energy efficiency across the site.

5.1 CO₂ Emission Sitewide Savings

A summary of the total sitewide carbon savings achieved through these technologies is presented below.

Flat No.	TER kgCO ₂ /yr/m ²	DER kgCO ₂ /yr/m ²	% Improvement
1	29.51	18.95	35.78
2	29.44	18.87	35.90
3	25.57	17.49	31.60
4	26.53	18.85	28.95
5	29.09	18.15	37.60
6	26.68	15.03	43.66
7	26.73	15.12	43.43
8	23.57	15.64	33.65
9	25.13	14.37	42.81
10	23.98	12.71	47
11	27.70	17.21	37.77
12	26.72	20.88	21.87
13	24.79	18.78	24.25
14	22.99	15.15	34.10
15	29.54	16.68	43.53
16	26.60	15.39	42.15
Site-Wide	26.23	16.89	35.61%

Table 5 – CO₂ Savings

6. Conclusion

The SAP 2012 modelling results clearly demonstrate that the Elgar Road development represents a high standard of energy performance and carbon reduction. By achieving a 35.61% reduction in regulated carbon emissions over the Part L 2012 baseline—and surpassing the more stringent 35% target set by Appeal Decision APP/E0345/W/23/3315618—this scheme not only meets but exceeds regulatory expectations. The integrated energy strategy, underpinned by a fabric-first design philosophy and supported by electric panel heating, heat pump hot water cylinders, and on-site renewable generation, reflects a robust and forward-thinking approach to sustainable construction.

Moreover, the project's compliance with both SAP 2012 and SAP 2021 standards further reinforces its future-proofed credentials and alignment with evolving building performance regulations. In doing so, the Elgar Road development underscores its contribution to wider carbon reduction goals and climate adaptation efforts.

All dwellings have been modelled to achieve a minimum EPC rating of B, in line with the client's minimum performance requirements. Additionally, the photovoltaic (PV) systems will be directly connected to each dwelling, ensuring that all residents benefit from on-site renewable energy generation. These features further enhance the development's environmental performance and affirm its status as a benchmark for sustainable residential design within the borough..

APPENDIX A – Full SAP Calculations

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	2455-06 - Flat 1	Issued on Date	05/05/2025
Assessment Reference	001	Prop Type Ref	
Property			

SAP Rating	88 B	DER	18.95	TER	29.51
Environmental	89 B	% DER<TER	35.78		
CO ₂ Emissions (t/year)	0.64	DFEE	37.96	TFEE	52.64
General Requirements Compliance	Pass	% DFEE<TFEE	27.88		

Assessor Details	Mrs. Naomi Sadler, Sadler Energy & Environmental Services Ltd, Tel: 01962 718870, naomi.sadler@sadlerenergy.co.uk	Assessor ID	4611-0001
Client	RHB PARTNERSHIP LLP , RHB		

Calculation of Heat Demand 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
Calculation of Heat Demand 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	53.3000 (1b)	2.4000 (2b)	127.9200 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.3000		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 127.9200 (5)
Dwelling volume			

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				1 * 10 =	10.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				10.0000 / (5) =	0.0782 (8)
Pressure test				Yes	
Measured/design AP50				4.0000	
Infiltration rate				0.2782 (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) =	0.2364 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate												
Effective ac	0.2483	0.2364	0.2364	0.2187	0.2187	0.1951	0.2010	0.1892	0.1951	0.2069	0.2069	0.2246 (22b)
	0.5308	0.5280	0.5280	0.5239	0.5239	0.5190	0.5202	0.5179	0.5190	0.5214	0.5214	0.5252 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.9500	1.0000	1.9500		(26)
Window (Uw = 1.20)			11.2900	1.1450	12.9275		(27)
Heat Loss Floor 1			53.3000	0.1200	6.3960		(28a)
External Wall 1	38.1600	13.2400	24.9200	0.1800	4.4856		(29a)
shelterd wall	15.8400		15.8400	0.1671	2.6464		(29a)
Total net area of external elements Aum(A, m ²)			107.3000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	28.4055	(33)
Party Wall 1			16.3200	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							2.7392 (36)
Total fabric heat loss						(33) + (36) =	31.1447 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	22.4078	22.2868	22.2868	22.1165	22.1165	21.9100	21.9594	21.8620	21.9100	22.0103	22.0103	22.1718 (38)
Average = Sum(39)m / 12 =	53.5525	53.4315	53.4315	53.2612	53.2612	53.0546	53.1041	53.0067	53.0546	53.1550	53.1550	53.3165 (39)
												53.2320 (39)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF HEAT DEMAND 09 Jan 2014

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0047	1.0025	1.0025	0.9993	0.9993	0.9954	0.9963	0.9945	0.9954	0.9973	0.9973	1.0003 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kwh/year)

Assumed occupancy	1.7874 (42)
Average daily hot water use (litres/day)	76.6508 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	84.3158	81.2498	78.1838	75.1177	72.0517	68.9857	68.9857	72.0517	75.1177	78.1838	81.2498	84.3158 (44)
Energy content	125.0380	109.3590	112.8487	98.3842	94.4020	81.4617	75.4863	86.6216	87.6562	102.1548	111.5099	121.0926 (45)
Energy content (annual)	Total = Sum(45)m =											1266.0150 (45)
Distribution loss (46)m = 0.15 x (45)m	18.7557	16.4038	16.9273	14.7576	14.1603	12.2193	11.3229	12.9932	13.1484	15.3232	16.7265	18.1639 (46)
Water storage loss:												201.0000 (47)
Store volume												1.6100 (48)
a) If manufacturer declared loss factor is known (kwh/day):												0.5400 (49)
Temperature factor from Table 2b												0.8694 (55)
Enter (49) or (54) in (55)												
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (57)
Primary 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 (59)
Total heat required for water heating calculated for each month	151.9894	133.7022	139.8001	124.4662	121.3534	107.5437	102.4377	113.5730	113.7382	129.1062	137.5919	148.0440 (62)
Solar input	0.0000	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	151.9894	133.7022	139.8001	124.4662	121.3534	107.5437	102.4377	113.5730	113.7382	129.1062	137.5919	148.0440 (64)
RHI water heating demand	41.5751	36.3619	37.5222	32.7128	31.3887	27.0860	25.0992	28.8017	29.1457	33.9665	37.0771	40.2633 (65)
Heat gains from water heating, kwh/month	41.5751	36.3619	37.5222	32.7128	31.3887	27.0860	25.0992	28.8017	29.1457	33.9665	37.0771	40.2633 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	34.7981	30.9074	25.1356	19.0293	14.2246	12.0090	12.9761	16.8669	22.6387	28.7450	33.5497	35.7653 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.5291	234.9420	228.8615	215.9169	199.5766	184.2190	173.9592	171.5463	177.6268	190.5714	206.9117	222.2693 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960 (71)
Water heating gains (Table 5)	55.8805	54.1099	50.4330	45.4344	42.1891	37.6195	33.7355	38.7119	40.4801	45.6539	51.4959	54.1173 (72)
Total internal gains	406.4676	403.2191	387.6900	363.6403	339.2501	317.1073	303.9306	310.3849	324.0054	348.2301	375.2171	395.4117 (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			1.6100		11.9814		0.6300		0.7000		0.7700	5.8953 (74)
East			9.6800		22.3313		0.6300		0.7000		0.7700	66.0635 (76)
Solar gains	71.9588	126.4762	206.1114	311.7426	374.8853	412.2296	387.5712	338.3071	260.3734	160.2569	91.8577	58.6554 (83)
Total gains	478.4264	529.6954	593.8013	675.3829	714.1353	729.3369	691.5019	648.6920	584.3788	508.4871	467.0749	454.0671 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, n11,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	69.1170	69.2735	69.2735	69.4951	69.4951	69.7656	69.7007	69.8287	69.7656	69.6339	69.6339	69.4230
alpha	5.6078	5.6182	5.6182	5.6330	5.6330	5.6510	5.6467	5.6552	5.6510	5.6423	5.6423	5.6282
util living area	0.9823	0.9683	0.9202	0.7875	0.5831	0.3630	0.2380	0.2614	0.5198	0.8419	0.9616	0.9859 (86)
MIT	20.3095	20.4388	20.6737	20.8925	20.9824	20.9990	20.9999	20.9999	20.9929	20.8703	20.5616	20.2753 (87)
Th 2	20.0794	20.0813	20.0813	20.0839	20.0839	20.0872	20.0864	20.0879	20.0872	20.0856	20.0856	20.0831 (88)
util rest of house	0.9770	0.9592	0.8989	0.7431	0.5214	0.2971	0.1679	0.1869	0.4412	0.7942	0.9486	0.9816 (89)
MIT 2	19.1920	19.3766	19.6999	19.9764	20.0708	20.0867	20.0864	20.0879	20.0833	19.9603	19.5565	19.1462 (90)
Living area fraction	19.8587	20.0103	20.2808	20.5229	20.6147	20.6310	20.6314	20.6320	20.6260	20.5832	20.1562	19.8199 (92)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF HEAT DEMAND 09 Jan 2014

Temperature adjustment												0.0000
adjusted MIT	19.8587	20.0103	20.2808	20.5229	20.6147	20.6310	20.6314	20.6320	20.6260	20.5032	20.1562	19.8199 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9755	0.9583	0.9040	0.7652	0.5575	0.3364	0.2097	0.2314	0.4880	0.8173	0.9498	0.9801 (94)
Useful gains	466.6903	507.6275	536.7725	516.7831	398.1577	245.3483	145.0330	150.0863	285.1754	415.6046	443.6184	445.0298 (95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Heat loss rate W	790.3655	769.9664	688.2434	565.7904	405.5677	245.6967	145.0499	150.1156	287.8719	473.2511	646.1601	784.8118 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	240.8144	176.2917	112.6944	35.2853	5.5130	0.0000	0.0000	0.0000	0.0000	42.8890	145.8300	252.7978 (98)
Space heating												1012.1155 (98)
RHI space heating demand												1012 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	53.3000 (1b)	x 2.4000 (2b)	= 127.9200 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.3000		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 127.9200 (5)
Dwelling volume			

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				1 * 10 =	10.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				10.0000 / (5) =	0.0782 (8)
Pressure test					Yes
Measured/design AP50					4.0000
Infiltration rate					0.2782 (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) =	0.2364 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infiltr rate	0.3015	0.2956	0.2896	0.2601	0.2542	0.2246	0.2246	0.2187	0.2364	0.2542	0.2660	0.2778 (22b)
Effective ac	0.5454	0.5437	0.5419	0.5338	0.5323	0.5252	0.5252	0.5239	0.5280	0.5323	0.5354	0.5386 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.9500	1.0000	1.9500		(26)
Window (Uw = 1.20)			11.2900	1.1450	12.9275		(27)
Heat Loss Floor 1			53.3000	0.1200	6.3960		(28a)
External Wall 1	38.1600	13.2400	24.9200	0.1800	4.4856		(29a)
shelterd wall	15.8400		15.8400	0.1671	2.6464		(29a)
Total net area of external elements Aum(A, m ²)			107.3000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 28.4055		(33)
Party Wall 1			16.3200	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							2.7392 (36)
Total fabric heat loss						(33) + (36) =	31.1447 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	23.0251	22.9506	22.8776	22.5346	22.4705	22.1718	22.1718
Heat transfer coeff	54.1698	54.0953	54.0223	53.6793	53.6152	53.3165	53.3165
Average = Sum(39)m / 12 =							53.6790 (39)
HLP	1.0163	1.0149	1.0136	1.0071	1.0059	1.0003	1.0003
HLP (average)							1.0071 (40)
Days in month	31	28	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7874 (42)
Average daily hot water use (litres/day)												76.6508 (43)
Daily hot water use	84.3158	81.2498	78.1838	75.1177	72.0517	68.9857	68.9857	72.0517	75.1177	78.1838	81.2498	84.3158 (44)
Energy conte	125.0380	109.3590	112.8487	98.3842	94.4020	81.4617	75.4863	86.6216	87.6562	102.1548	111.5099	121.0926 (45)
Energy content (annual)												Total = Sum(45)m = 1206.0150 (45)
Distribution loss (46)m = 0.15 x (45)m	18.7557	16.4038	16.9273	14.7576	14.1603	12.2193	11.3229	12.9932	13.1484	15.3232	16.7265	18.1639 (46)
Water storage loss:												201.0000 (47)
Store volume												1.6100 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

Enter (49) or (54) in (55)	0.8694 (55)											
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (57)
Primary 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 (59)
Total heat required for water heating calculated for each month	151.9894	133.7022	139.8001	124.4662	121.3534	107.5437	102.4377	113.5730	113.7382	129.1062	137.5919	148.0440 (62)
Solar input	0.0000	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	151.9894	133.7022	139.8001	124.4662	121.3534	107.5437	102.4377	113.5730	113.7382	129.1062	137.5919	148.0440 (64)
Heat gains from water heating, kWh/month	41.5751	36.3619	37.5222	32.7128	31.3887	27.0860	25.0992	28.8017	29.1457	33.9665	37.0771	40.2633 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	34.7981	30.9074	25.1356	19.0293	14.2246	12.0090	12.9761	16.8669	22.6387	28.7450	33.5497	35.7653 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.5291	234.9420	228.8615	215.9169	199.5766	184.2190	173.9592	171.5463	177.6268	190.5714	206.9117	222.2693 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960 (71)
Water heating gains (Table 5)	55.8805	54.1099	50.4330	45.4344	42.1891	37.6195	33.7355	38.7119	40.4801	45.6539	51.4959	54.1173 (72)
Total internal gains	406.4676	403.2191	387.6900	363.6403	339.2501	317.1073	303.9306	310.3849	324.0054	348.2301	375.2171	395.4117 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W			
North				1.6100	10.6334	0.6300	0.7000	0.7700	5.2320 (74)			
East				9.6800	19.6403	0.6300	0.7000	0.7700	58.1025 (76)			
Solar gains	63.3345	123.6594	204.1732	300.2859	371.3289	381.8436	362.8060	309.2341	238.1293	146.7701	78.9013	52.1423 (83)
Total gains	469.8021	526.8785	591.8632	663.9262	710.5789	698.9509	666.7366	619.6191	562.1347	495.0003	454.1184	447.5540 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000 (85)											
Utilisation factor for gains for living area, n1,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	68.3294	68.4235	68.5160	68.9537	69.0362	69.4230	69.4230	69.4951	69.2735	69.0362	68.8695	68.6960
alpha	5.5553	5.5616	5.5677	5.5969	5.6024	5.6282	5.6282	5.6330	5.6182	5.6024	5.5913	5.5797
util living area	0.9872	0.9749	0.9390	0.8390	0.6699	0.4837	0.3512	0.3941	0.6334	0.8942	0.9748	0.9900 (86)
MIT	20.2038	20.3546	20.5888	20.8326	20.9591	20.9944	20.9992	20.9986	20.9771	20.7919	20.4495	20.1645 (87)
Th 2	20.0698	20.0709	20.0721	20.0774	20.0784	20.0831	20.0831	20.0839	20.0813	20.0784	20.0764	20.0743 (88)
util rest of house	0.9834	0.9678	0.9225	0.8024	0.6135	0.4164	0.2784	0.3163	0.5580	0.8595	0.9663	0.9870 (89)
MIT 2	19.0323	19.2487	19.5766	19.8991	20.0432	20.0797	20.0828	20.0834	20.0656	19.8591	19.3914	18.9791 (90)
Living area fraction	19.7312	19.9085	20.1805	20.4561	20.5896	20.6254	20.6296	20.6294	20.6094	20.4157	20.0227	19.6864 (92)
MIT	19.7312	19.9085	20.1805	20.4561	20.5896	20.6254	20.6296	20.6294	20.6094	20.4157	20.0227	19.6864 (93)
Temperature adjustment												0.0000
adjusted MIT	19.7312	19.9085	20.1805	20.4561	20.5896	20.6254	20.6296	20.6294	20.6094	20.4157	20.0227	19.6864 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	461.2269	509.1403	547.2623	543.2017	458.5765	319.0561	214.5937	224.7823	338.4831	432.2669	438.5604	441.0263 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate w	835.9071	811.8897	739.0519	620.3224	476.6178	321.2540	214.8422	225.2627	347.8085	526.2680	694.5275	834.4166 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	278.7621	203.4476	142.6915	55.5269	13.4227	0.0000	0.0000	0.0000	0.0000	69.9368	184.2963	292.6823 (98)
Space heating												1240.7663 (98)
Space heating per m2										(98) / (4) =		23.2789 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 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)
Fraction of main heating from main system 2													0.0000 (203)
Fraction of total heating from main system 1													1.0000 (204)
Fraction of total heating from main system 2													0.0000 (205)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1240.7663 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	278.7621	203.4476	142.6915	55.5269	13.4227	0.0000	0.0000	0.0000	0.0000	69.9368	184.2963	292.6823	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	278.7621	203.4476	142.6915	55.5269	13.4227	0.0000	0.0000	0.0000	0.0000	69.9368	184.2963	292.6823	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Water heating requirement	151.9894	133.7022	139.8001	124.4662	121.3534	107.5437	102.4377	113.5730	113.7382	129.1062	137.5919	148.0440	(64)
Efficiency of water heater (217)m	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	(216)
Fuel for water heating, kWh/month	43.4989	38.2651	40.0103	35.6218	34.7309	30.7787	29.3173	32.5042	32.5515	36.9498	39.3784	42.3697	(219)
Water heating fuel used												435.9766	(219)
Annual totals kWh/year													
Space heating fuel - main system												1240.7663	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												245.8184	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.50 * 1080 * 1.00) =												-431.8098	(233)
Total delivered energy for all uses												1490.7515	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1240.7663	13.1900	163.6571 (240)
Space heating - main system 2	0.0000	13.1900	0.0000 (241)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	435.9766	13.1900	57.5053 (247)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Energy for lighting	245.8184	13.1900	32.4235 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit	-431.8098	13.1900	-56.9557 (252)
Total energy cost			196.6301 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.4200 (256)
SAP value		0.8401 (257)
SAP rating (Section 12)		88.2802
SAP band		88 (258)
		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1240.7663	0.5190	643.9577 (261)
Space heating - main system 2	0.0000	0.5190	0.0000 (262)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	435.9766	0.5190	226.2719 (264)
Space and water heating			870.2296 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	245.8184	0.5190	127.5798 (268)
Energy saving/generation technologies			
PV Unit	-431.8098	0.5190	-224.1093 (269)
Total kg/year			773.7000 (272)
CO2 emissions per m2			14.5200 (273)
EI value			89.4531
EI rating			89 (274)
EI band			B

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

Calculation of stars for heating and DHW

Main heating 1 energy efficiency	$13.19 \times (1 + 0.29 \times 0.00) / 1.0000 = 13.190$, stars = 1
Main heating 2 energy efficiency	(does water heating only)
Main heating 1 environmental impact	$0.519 \times (1 + 0.29 \times 0.00) / 1.0000 = 0.5190$, stars = 2
Main heating 2 environmental impact	(does water heating only)
Water heating energy efficiency	$13.19 / 3.4941 = 3.775$, stars = 5
Water heating environmental impact	$0.519 / 3.4941 = 0.1485$, stars = 5

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	53.3000 (1b)	x 2.4000 (2b)	= 127.9200 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.3000		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 127.9200 (5)
Dwelling volume			

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour				
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000 (6a)				
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000 (6b)				
Number of intermittent fans							1 * 10 =	10.0000 (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) =						10.0000 / (5) =	0.0782 (8)				
Pressure test							Yes					
Measured/design AP50							4.0000					
Infiltration rate							0.2782 (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) =	0.2364 (21)				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infiltr rate	0.2483	0.2364	0.2364	0.2187	0.2187	0.1951	0.2010	0.1892	0.1951	0.2069	0.2069	0.2246 (22b)
Effective ac	0.5308	0.5280	0.5280	0.5239	0.5239	0.5190	0.5202	0.5179	0.5190	0.5214	0.5214	0.5252 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.9500	1.0000	1.9500		(26)					
Window (Uw = 1.20)			11.2900	1.1450	12.9275		(27)					
Heat Loss Floor 1			53.3000	0.1200	6.3960		(28a)					
External Wall 1	38.1600	13.2400	24.9200	0.1800	4.4856		(29a)					
shelterd wall	15.8400		15.8400	0.1671	2.6464		(29a)					
Total net area of external elements Aum(A, m2)			107.3000				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.4055		(33)					
Party Wall 1			16.3200	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							2.7392 (36)					
Total fabric heat loss						(33) + (36) =	31.1447 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 22.4078	Feb 22.2868	Mar 22.2868	Apr 22.1165	May 22.1165	Jun 21.9100	Jul 21.9594	Aug 21.8620	Sep 21.9100	Oct 22.0103	Nov 22.0103	Dec 22.1718 (38)
Heat transfer coeff	53.5525	53.4315	53.4315	53.2612	53.2612	53.0546	53.1041	53.0067	53.0546	53.1550	53.1550	53.3165 (39)
Average = Sum(39)m / 12 =												53.2320 (39)
HLP	Jan 1.0047	Feb 1.0025	Mar 1.0025	Apr 0.9993	May 0.9993	Jun 0.9954	Jul 0.9963	Aug 0.9945	Sep 0.9954	Oct 0.9973	Nov 0.9973	Dec 1.0003 (40)
HLP (average)												0.9987 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7874 (42)
Average daily hot water use (litres/day)												76.6508 (43)
Daily hot water use	Jan 84.3158	Feb 81.2498	Mar 78.1838	Apr 75.1177	May 72.0517	Jun 68.9857	Jul 68.9857	Aug 72.0517	Sep 75.1177	Oct 78.1838	Nov 81.2498	Dec 84.3158 (44)
Energy conte	125.0380	109.3590	112.8487	98.3842	94.4020	81.4617	75.4863	86.6216	87.6562	102.1548	111.5099	121.0926 (45)
Energy content (annual)												Total = Sum(45)m = 1206.0150 (45)
Distribution loss (46)m = 0.15 x (45)m	18.7557	16.4038	16.9273	14.7576	14.1603	12.2193	11.3229	12.9932	13.1484	15.3232	16.7265	18.1639 (46)
Water storage loss:												201.0000 (47)
Store volume												1.6100 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

Enter (49) or (54) in (55)												0.8694 (55)	
Total storage loss													
26.9514 24.3432 26.9514 26.0820 26.9514 26.0820 26.9514 26.9514 26.0820 26.9514 26.0820 26.9514 (56)													
If cylinder contains dedicated solar storage													
26.9514 24.3432 26.9514 26.0820 26.9514 26.0820 26.9514 26.9514 26.0820 26.9514 26.0820 26.9514 (57)													
Primary 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 (59)													
Total heat required for water heating calculated for each month													
151.9894 133.7022 139.8001 124.4662 121.3534 107.5437 102.4377 113.5730 113.7382 129.1062 137.5919 148.0440 (62)													
Solar input 0.0000 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													
151.9894 133.7022 139.8001 124.4662 121.3534 107.5437 102.4377 113.5730 113.7382 129.1062 137.5919 148.0440 (64)													
Total per year (kwh/year) = Sum(64)m = 1523.3460 (64)													
Heat gains from water heating, kWh/month													
41.5751 36.3619 37.5222 32.7128 31.3887 27.0860 25.0992 28.8017 29.1457 33.9665 37.0771 40.2633 (65)													

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	34.7981	30.9074	25.1356	19.0293	14.2246	12.0090	12.9761	16.8669	22.6387	28.7450	33.5497	35.7653 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.5291	234.9420	228.8615	215.9169	199.5766	184.2190	173.9592	171.5463	177.6268	190.5714	206.9117	222.2693 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960 (71)
Water heating gains (Table 5)	55.8805	54.1099	50.4330	45.4344	42.1891	37.6195	33.7355	38.7119	40.4801	45.6539	51.4959	54.1173 (72)
Total internal gains	406.4676	403.2191	387.6900	363.6403	339.2501	317.1073	303.9306	310.3849	324.0054	348.2301	375.2171	395.4117 (73)

6. Solar gains

[Jan]				Area m2	Solar Flux Table 6a W/m2		Specific data or Table 6b		Specific data or Table 6c		Access factor Table 6d		Gains W	
North				1.6100	11.9814		0.6300		0.7000		0.7700		5.8953 (74)	
East				9.6800	22.3313		0.6300		0.7000		0.7700		66.0635 (76)	
Solar gains	71.9588	126.4762	206.1114	311.7426	374.8853	412.2296	387.5712	338.3071	260.3734	160.2569	91.8577	58.6554 (83)		
Total gains	478.4264	529.6954	593.8013	675.3829	714.1353	729.3369	691.5019	648.6920	584.3788	508.4871	467.0749	454.0671 (84)		

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, n1,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	69.1170	69.2735	69.2735	69.4951	69.4951	69.7656	69.7007	69.8287	69.7656	69.6339	69.6339	69.4230
alpha	5.6078	5.6182	5.6182	5.6330	5.6330	5.6510	5.6467	5.6552	5.6510	5.6423	5.6423	5.6282
util living area	0.9823	0.9683	0.9202	0.7875	0.5831	0.3630	0.2380	0.2614	0.5198	0.8419	0.9616	0.9859 (86)
MIT	20.3095	20.4388	20.6737	20.8925	20.9824	20.9990	20.9999	20.9999	20.9929	20.8703	20.5616	20.2753 (87)
Th 2	20.0794	20.0813	20.0813	20.0839	20.0839	20.0872	20.0864	20.0879	20.0872	20.0856	20.0856	20.0831 (88)
util rest of house	0.9770	0.9592	0.8989	0.7431	0.5214	0.2971	0.1679	0.1869	0.4412	0.7942	0.9486	0.9816 (89)
MIT 2	19.1920	19.3766	19.6999	19.9764	20.0708	20.0867	20.0864	20.0879	20.0833	19.9603	19.5565	19.1462 (90)
Living area fraction	19.8587	20.0103	20.2808	20.5229	20.6147	20.6310	20.6314	20.6320	fLA = Living area / (4) =			
MIT	19.8587	20.0103	20.2808	20.5229	20.6147	20.6310	20.6314	20.6320	20.6260	20.5032	20.1562	19.8199 (91)
Temperature adjustment	19.8587	20.0103	20.2808	20.5229	20.6147	20.6310	20.6314	20.6320	20.6260	20.5032	20.1562	0.0000
adjusted MIT	19.8587	20.0103	20.2808	20.5229	20.6147	20.6310	20.6314	20.6320	20.6260	20.5032	20.1562	19.8199 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9755	0.9583	0.9040	0.7652	0.5575	0.3364	0.2097	0.2314	0.4880	0.8173	0.9498	0.9801 (94)
Ext temp.	466.6903	507.6275	536.7725	516.7831	398.1577	245.3483	145.0330	150.0863	285.1754	415.6046	443.6184	445.0298 (95)
Heat loss rate w	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Month fracti	790.3655	769.9664	688.2434	565.7904	405.5677	245.6967	145.0499	150.1156	287.8719	473.2511	646.1601	784.8118 (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	240.8144	176.2917	112.6944	35.2853	5.5130	0.0000	0.0000	0.0000	0.0000	42.8890	145.8300	252.7978 (98)
Space heating per m2												1012.1155 (98)
										(98) / (4) =		18.9890 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 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)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	1012.1155	(211)
Space heating requirement	240.8144	
Space heating efficiency (main heating system 1)	100.0000	
Space heating fuel (main heating system)	240.8144	
Space heating efficiency (main heating system 2)	0.0000	
Space heating fuel (main heating system 2)	0.0000	
Water heating requirement	0.0000	
Space heating fuel used, main system 2	0.0000	
Water heating requirement	151.9894	
Efficiency of water heater	349.4100	
Fuel for water heating, kWh/month	43.4989	
Water heating fuel used	435.9766	
Annual totals kWh/year		
Space heating fuel - main system		1012.1155 (211)
Space heating fuel - secondary		0.0000 (215)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year		0.0000 (231)
Electricity for lighting (calculated in Appendix L)		245.8184 (232)
Energy saving/generation technologies (Appendices M, N and Q)		
PV Unit 0 (0.80 * 0.50 * 1140 * 1.00) =		-456.0399 (233)
Total delivered energy for all uses		1237.8767 (238)

10a. Fuel costs - using BEDF prices (554)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1012.1155	25.0500	253.5349 (240)
Space heating - main system 2	0.0000	25.0500	0.0000 (241)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	435.9766	25.0500	109.2121 (247)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Energy for lighting	245.8184	25.0500	61.5775 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit	-456.0399	25.0500	-114.2380 (252)
Total energy cost			310.0866 (255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1012.1155	0.5190	525.2880 (261)
Space heating - main system 2	0.0000	0.5190	0.0000 (262)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	435.9766	0.5190	226.2719 (264)
Space and water heating			751.5598 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	245.8184	0.5190	127.5798 (268)
Energy saving/generation technologies			
PV Unit	-456.0399	0.5190	-236.6847 (269)
Total kg/year			642.4549 (272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1012.1155	3.0700	3107.1947 (261)
Space heating - main system 2	0.0000	3.0700	0.0000 (262)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	435.9766	3.0700	1338.4483 (264)
Space and water heating			4445.6430 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	245.8184	3.0700	754.6626 (268)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

Energy saving/generation technologies			
PV unit	-456.0399	3.0700	-1400.0425 (269)
Primary energy kwh/year			3800.2631 (272)
Primary energy kwh/m2/year			71.2995 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:	B 88
Current environmental impact rating:	B 89

(For testing purposes):	
A	Not considered
B	Not considered
C	Not considered
D	Not considered
E Low energy lighting	Already installed
F	Not considered
G	Not considered
H	Not considered
I	Not considered
J	Not considered
K	Not considered
M	Not considered
N Solar water heating	Not applicable
O	Not considered
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U Solar photovoltaic panels	Not applicable
A2	Not considered
A3	Not considered
T2	Not considered
W	Not considered
X	Not considered
Y	Not considered
J2	Not considered
Q2	Not considered
Z1	Not considered
Z2	Not considered
Z3	Not considered
Z4	Not considered
Z5	Not considered
V2 Wind turbine	Not applicable
L2	Not considered
Q3	Not considered
O3	Not considered

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
	Total Savings £0		0.00 kg/m²

Potential energy efficiency rating:	B 88
Potential environmental impact rating:	B 89

Fuel prices for cost data on this page from database revision number 554 TEST (31 Oct 2024)
Recommendation texts revision number 4.9c (22 Feb 2014)

Typical heating and lighting costs of this home (per year, Thames Valley):			
	Current	Potential	Saving
Electricity	£424	£424	£0
Space heating	£254	£254	£0
Water heating	£109	£109	£0
Lighting	£62	£62	£0
Generated (PV)	-£114	-£114	£0
Total cost of fuels	£310	£310	£0
Total cost of uses	£311	£311	£0
Delivered energy	23 kWh/m²	23 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.6 tonnes	0.6 tonnes	0.0 tonnes
CO2 emissions per m²	12 kg/m²	12 kg/m²	0 kg/m²
Primary energy	71 kWh/m²	71 kWh/m²	0 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	2455-06 - Flat 2	Issued on Date	05/05/2025
Assessment Reference	002	Prop Type Ref	
Property			

SAP Rating	88 B	DER	18.87	TER	29.44
Environmental	90 B	% DER<TER	35.90		
CO ₂ Emissions (t/year)	0.63	DFEE	37.37	TFEE	51.94
General Requirements Compliance	Pass	% DFEE<TFEE	28.06		

Assessor Details	Mrs. Naomi Sadler, Sadler Energy & Environmental Services Ltd, Tel: 01962 718870, naomi.sadler@sadlerenergy.co.uk	Assessor ID	4611-0001
Client	RHB PARTNERSHIP LLP , RHB		

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	53.3000 (1b)	2.4000 (2b)	127.9200 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.3000		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 127.9200 (5)
Dwelling volume			

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				1 * 10 =	10.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				10.0000 / (5) =	0.0782 (8)
Pressure test				Yes	
Measured/design AP50				4.0000	
Infiltration rate				0.2782 (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) =	0.2364 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate												
Effective ac	0.2483	0.2364	0.2364	0.2187	0.2187	0.1951	0.2010	0.1892	0.1951	0.2069	0.2069	0.2246 (22b)
	0.5308	0.5280	0.5280	0.5239	0.5239	0.5190	0.5202	0.5179	0.5190	0.5214	0.5214	0.5252 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.9500	1.0000	1.9500		(26)
Window (Uw = 1.20)			9.6800	1.1450	11.0840		(27)
Heat Loss Floor 1			53.3000	0.1200	6.3960		(28a)
External Wall 1	34.5600	11.6300	22.9300	0.1800	4.1274		(29a)
shelterd wall	19.4400		19.4400	0.1671	3.2478		(29a)
Total net area of external elements Aum(A, m ²)			107.3000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 26.8052		(33)
Party Wall 1			31.6800	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							3.0820 (36)
Total fabric heat loss							(33) + (36) = 29.8872 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 22.4078	Feb 22.2868	Mar 22.2868	Apr 22.1165	May 22.1165	Jun 21.9100	Jul 21.9594	Aug 21.8620	Sep 21.9100	Oct 22.0103	Nov 22.0103	Dec 22.1718 (38)
Heat transfer coeff	52.2950	52.1740	52.1740	52.0037	52.0037	51.7972	51.8466	51.7492	51.7972	51.8975	51.8975	52.0590 (39)
Average = Sum(39)m / 12 =												51.9745 (39)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF HEAT DEMAND 09 Jan 2014

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9811	0.9789	0.9789	0.9757	0.9757	0.9718	0.9727	0.9709	0.9718	0.9737	0.9737	0.9767 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kwh/year)

Assumed occupancy	1.7874 (42)
Average daily hot water use (litres/day)	76.6508 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	84.3158	81.2498	78.1838	75.1177	72.0517	68.9857	68.9857	72.0517	75.1177	78.1838	81.2498	84.3158 (44)
Energy content	125.0380	109.3590	112.8487	98.3842	94.4020	81.4617	75.4863	86.6216	87.6562	102.1548	111.5099	121.0926 (45)
Energy content (annual)												1266.0150 (45)
Distribution loss (46)m = 0.15 x (45)m	18.7557	16.4038	16.9273	14.7576	14.1603	12.2193	11.3229	12.9932	13.1484	15.3232	16.7265	18.1639 (46)
Water storage loss:												
Store volume												201.0000 (47)
a) If manufacturer declared loss factor is known (kwh/day):												1.6100 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8694 (55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (57)
Primary 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 (59)
Total heat required for water heating calculated for each month	151.9894	133.7022	139.8001	124.4662	121.3534	107.5437	102.4377	113.5730	113.7382	129.1062	137.5919	148.0440 (62)
Solar input	0.0000	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	151.9894	133.7022	139.8001	124.4662	121.3534	107.5437	102.4377	113.5730	113.7382	129.1062	137.5919	148.0440 (64)
RHI water heating demand												1523.3460 (64)
Heat gains from water heating, kwh/month	41.5751	36.3619	37.5222	32.7128	31.3887	27.0860	25.0992	28.8017	29.1457	33.9665	37.0771	40.2633 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	35.4146	31.4550	25.5809	19.3664	14.4766	12.2218	13.2060	17.1657	23.0398	29.2543	34.1441	36.3989 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.5291	234.9420	228.8615	215.9169	199.5766	184.2190	173.9592	171.5463	177.6268	190.5714	206.9117	222.2693 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960 (71)
Water heating gains (Table 5)	55.8805	54.1099	50.4330	45.4344	42.1891	37.6195	33.7355	38.7119	40.4801	45.6539	51.4959	54.1173 (72)
Total internal gains	407.0841	403.7667	388.1353	363.9774	339.5021	317.3201	304.1605	310.6837	324.4065	348.7394	375.8115	396.0453 (73)

6. Solar gains

[Jan]				Area	Solar flux		g		FF		Access	Gains
				m2	Table 6a		Specific data		Specific data		factor	W
					W/m2		or Table 6b		or Table 6c		Table 6d	
East				9.6800	22.3313		0.6300		0.7000		0.7700	66.0635 (76)
Solar gains	66.0635	116.2483	188.7667	282.9071	337.0958	369.0130	347.6251	305.8277	237.7086	147.2013	84.3880	53.8003 (83)
Total gains	473.1475	520.0150	576.9019	646.8845	676.5978	686.3330	651.7857	616.5114	562.1151	495.9406	460.1995	449.8456 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, n11,m (see Table 9a)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	70.7790	70.9431	70.9431	71.1755	71.1755	71.4593	71.3912	71.5255	71.4593	71.3212	71.3212	71.0999
util living area	5.7186	5.7295	5.7295	5.7450	5.7450	5.7640	5.7594	5.7684	5.7640	5.7547	5.7547	5.7400
	0.9825	0.9692	0.9240	0.7992	0.5998	0.3765	0.2465	0.2685	0.5276	0.8448	0.9620	0.9860 (86)
MIT	20.3335	20.4553	20.6790	20.8904	20.9815	20.9989	20.9999	20.9999	20.9930	20.8747	20.5777	20.3010 (87)
Th 2	20.0991	20.1010	20.1010	20.1037	20.1037	20.1069	20.1061	20.1076	20.1069	20.1053	20.1053	20.1028 (88)
util rest of house	0.9772	0.9603	0.9035	0.7562	0.5382	0.3097	0.1755	0.1937	0.4496	0.7981	0.9492	0.9817 (89)
MIT 2	19.2417	19.4159	19.7243	19.9932	20.0896	20.1064	20.1061	20.1076	20.1031	19.9838	19.5949	19.1983 (90)
Living area fraction									fLA = Living area / (4) =			0.6492 (91)
MIT	19.9504	20.0906	20.3441	20.5756	20.6686	20.6858	20.6863	20.6868	20.6808	20.5621	20.2329	19.9141 (92)
Temperature adjustment												0.0000

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF HEAT DEMAND 09 Jan 2014

adjusted MIT 19.9504 20.0906 20.3441 20.5756 20.6686 20.6858 20.6863 20.6868 20.6808 20.5621 20.2329 19.9141 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9762	0.9602	0.9096	0.7797	0.5775	0.3531	0.2216	0.2423	0.5001	0.8233	0.9513	0.9806 (94)
Useful gains	461.8735	499.3272	524.7349	504.3484	390.7086	242.3189	144.4429	149.3601	281.1219	408.3009	437.7700	441.1210 (95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Heat loss rate W	776.6021	756.0351	675.3435	555.1702	398.7931	242.7114	144.4621	149.3920	283.8887	465.1110	634.8563	771.2069 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	234.1581	172.5077	112.0528	36.5918	6.0149	0.0000	0.0000	0.0000	0.0000	42.2667	141.9022	245.5839 (98)
Space heating												991.0779 (98)
RHI space heating demand												991 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	53.3000 (1b)	x 2.4000 (2b)	= 127.9200 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 127.9200 (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				1 * 10 =	10.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				10.0000 / (5) = 0.0782 (8)
Pressure test					Yes
Measured/design AP50					4.0000
Infiltration rate					0.2782 (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) =				0.2364 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infiltr rate	0.3015	0.2956	0.2896	0.2601	0.2542	0.2246	0.2246	0.2187	0.2364	0.2542	0.2660	0.2778 (22b)
Effective ac	0.5454	0.5437	0.5419	0.5338	0.5323	0.5252	0.5252	0.5239	0.5280	0.5323	0.5354	0.5386 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.9500	1.0000	1.9500		(26)
Window (Uw = 1.20)			9.6800	1.1450	11.0840		(27)
Heat Loss Floor 1			53.3000	0.1200	6.3960		(28a)
External Wall 1	34.5600	11.6300	22.9300	0.1800	4.1274		(29a)
shelterd wall	19.4400		19.4400	0.1671	3.2478		(29a)
Total net area of external elements Aum(A, m ²)			107.3000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 26.8052		(33)
Party Wall 1			31.6800	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							3.0820 (36)
Total fabric heat loss						(33) + (36) =	29.8872 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	23.0251	22.9506	22.8776	22.5346	22.4705	22.1718	22.1718
Heat transfer coeff	52.9123	52.8378	52.7648	52.4218	52.3577	52.0590	52.0590
Average = Sum(39)m / 12 =							52.4215 (39)
HLP	0.9927	0.9913	0.9900	0.9835	0.9823	0.9767	0.9767
HLP (average)							0.9873 (40)
Days in month	31	28	31	30	31	30	31
							31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7874 (42)
Average daily hot water use (litres/day)												76.6508 (43)
Daily hot water use	84.3158	81.2498	78.1838	75.1177	72.0517	68.9857	68.9857	72.0517	75.1177	78.1838	81.2498	84.3158 (44)
Energy conte	125.0380	109.3590	112.8487	98.3842	94.4020	81.4617	75.4863	86.6216	87.6562	102.1548	111.5099	121.0926 (45)
Energy content (annual)												Total = Sum(45)m = 1206.0150 (45)
Distribution loss (46)m = 0.15 x (45)m	18.7557	16.4038	16.9273	14.7576	14.1603	12.2193	11.3229	12.9932	13.1484	15.3232	16.7265	18.1639 (46)
Water storage loss:												201.0000 (47)
Store volume												1.6100 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

Enter (49) or (54) in (55)	0.8694 (55)											
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (57)
Primary 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 (59)
Total heat required for water heating calculated for each month	151.9894	133.7022	139.8001	124.4662	121.3534	107.5437	102.4377	113.5730	113.7382	129.1062	137.5919	148.0440 (62)
Solar input	0.0000	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	151.9894	133.7022	139.8001	124.4662	121.3534	107.5437	102.4377	113.5730	113.7382	129.1062	137.5919	148.0440 (64)
Heat gains from water heating, kWh/month	41.5751	36.3619	37.5222	32.7128	31.3887	27.0860	25.0992	28.8017	29.1457	33.9665	37.0771	40.2633 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	35.4146	31.4550	25.5809	19.3664	14.4766	12.2218	13.2060	17.1657	23.0398	29.2543	34.1441	36.3989 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.5291	234.9420	228.8615	215.9169	199.5766	184.2190	173.9592	171.5463	177.6268	190.5714	206.9117	222.2693 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960 (71)
Water heating gains (Table 5)	55.8805	54.1099	50.4330	45.4344	42.1891	37.6195	33.7355	38.7119	40.4801	45.6539	51.4959	54.1173 (72)
Total internal gains	407.0841	403.7667	388.1353	363.9774	339.5021	317.3201	304.1605	310.6837	324.4065	348.7394	375.8115	396.0453 (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					9.6800	19.6403	0.6300	0.7000	0.7700	58.1025 (76)		
Solar gains	58.1025	113.6607	187.1830	272.9953	334.5660	342.4878	326.0624	280.0828	217.7016	134.8680	72.4469	47.7806 (83)
Total gains	465.1865	517.4274	575.3183	636.9727	674.0680	659.8079	630.2229	590.7665	542.1081	483.6074	448.2584	443.8260 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000 (85)											
Utilisation factor for gains for living area, n1,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	69.9533	70.0519	70.1488	70.6078	70.6943	71.0999	71.0999	71.1755	70.9431	70.6943	70.5195	70.3376
alpha	5.6636	5.6701	5.6766	5.7072	5.7130	5.7400	5.7400	5.7450	5.7295	5.7130	5.7013	5.6892
util living area	0.9873	0.9757	0.9422	0.8491	0.6871	0.5000	0.3628	0.4036	0.6413	0.8965	0.9751	0.9900 (86)
MIT	20.2302	20.3725	20.5952	20.8302	20.9568	20.9940	20.9992	20.9986	20.9775	20.7984	20.4686	20.1926 (87)
Th 2	20.0894	20.0906	20.0917	20.0971	20.0981	20.1028	20.1028	20.1037	20.1010	20.0981	20.0961	20.0939 (88)
util rest of house	0.9836	0.9689	0.9265	0.8140	0.6314	0.4321	0.2892	0.3257	0.5668	0.8626	0.9667	0.9871 (89)
MIT 2	19.0854	19.2898	19.6023	19.9149	20.0605	20.0992	20.1025	20.1031	20.0854	19.8848	19.4340	19.0346 (90)
Living area fraction	19.8286	19.9927	20.2469	20.5091	20.6423	20.6801	20.6846	20.6844	20.6645	20.4778	20.1056	19.7863 (92)
MIT	19.8286	19.9927	20.2469	20.5091	20.6423	20.6801	20.6846	20.6844	20.6645	20.4778	20.1056	19.7863 (93)
Temperature adjustment	19.8286	19.9927	20.2469	20.5091	20.6423	20.6801	20.6846	20.6844	20.6645	20.4778	20.1056	19.7863 (93)
adjusted MIT	19.8286	19.9927	20.2469	20.5091	20.6423	20.6801	20.6846	20.6844	20.6645	20.4778	20.1056	19.7863 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9823	0.9680	0.9295	0.8308	0.6656	0.4760	0.3370	0.3763	0.6142	0.8780	0.9668	0.9858 (94)
Ext temp.	456.9521	500.8655	534.7491	529.2124	448.6815	314.0747	212.3643	222.2913	332.9838	424.6243	433.3789	437.5342 (95)
Heat loss rate w	4.3000	4.0000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Month fracti	821.6519	797.4630	725.3503	608.5687	468.2095	316.5214	212.6402	222.8041	342.4973	517.1811	682.6335	820.2003 (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	271.3367	199.3135	141.8073	57.1365	14.5221	0.0000	0.0000	0.0000	0.0000	68.8623	179.4633	284.7035 (98)
										(98) / (4) =		22.8357 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 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)
Fraction of main heating from main system 2													0.0000 (203)
Fraction of total heating from main system 1													1.0000 (204)
Fraction of total heating from main system 2													0.0000 (205)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1217.1451 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	271.3367	199.3135	141.8073	57.1365	14.5221	0.0000	0.0000	0.0000	0.0000	68.8623	179.4633	284.7035	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	271.3367	199.3135	141.8073	57.1365	14.5221	0.0000	0.0000	0.0000	0.0000	68.8623	179.4633	284.7035	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Water heating requirement	151.9894	133.7022	139.8001	124.4662	121.3534	107.5437	102.4377	113.5730	113.7382	129.1062	137.5919	148.0440	(64)
Efficiency of water heater (217)m	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	(216)
Fuel for water heating, kWh/month	43.4989	38.2651	40.0103	35.6218	34.7309	30.7787	29.3173	32.5042	32.5515	36.9498	39.3784	42.3697	(219)
Water heating fuel used													(219)
Annual totals kWh/year													
Space heating fuel - main system													1217.1451 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year													0.0000 (231)
Electricity for lighting (calculated in Appendix L)													250.1734 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.50 * 1000 * 1.00) =										-431.8098			-431.8098 (233)
Total delivered energy for all uses													1471.4853 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1217.1451	13.1900	160.5414 (240)
Space heating - main system 2	0.0000	13.1900	0.0000 (241)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	435.9766	13.1900	57.5053 (247)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Energy for lighting	250.1734	13.1900	32.9979 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit	-431.8098	13.1900	-56.9557 (252)
Total energy cost			194.0889 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.8293 (257)
SAP value		88.4317
SAP rating (Section 12)		88 (258)
SAP band		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1217.1451	0.5190	631.6983 (261)
Space heating - main system 2	0.0000	0.5190	0.0000 (262)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	435.9766	0.5190	226.2719 (264)
Space and water heating			857.9702 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	250.1734	0.5190	129.8400 (268)
Energy saving/generation technologies			
PV Unit	-431.8098	0.5190	-224.1093 (269)
Total kg/year			763.7009 (272)
CO2 emissions per m2			14.3300 (273)
EI value			89.5894
EI rating			90 (274)
EI band			B

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

Calculation of stars for heating and DHW

Main heating 1 energy efficiency	$13.19 \times (1 + 0.29 \times 0.00) / 1.0000 = 13.190$, stars = 1
Main heating 2 energy efficiency	(does water heating only)
Main heating 1 environmental impact	$0.519 \times (1 + 0.29 \times 0.00) / 1.0000 = 0.5190$, stars = 2
Main heating 2 environmental impact	(does water heating only)
Water heating energy efficiency	$13.19 / 3.4941 = 3.775$, stars = 5
Water heating environmental impact	$0.519 / 3.4941 = 0.1485$, stars = 5

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	53.3000	2.4000	127.9200
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.3000		
Dwelling volume			127.9200

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				1 * 10 =	10.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				10.0000 / (5) = 0.0782 (8)
Pressure test					Yes
Measured/design AP50					4.0000
Infiltration rate					0.2782 (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) =				0.2364 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infiltr rate	0.2483	0.2364	0.2364	0.2187	0.2187	0.1951	0.2010	0.1892	0.1951	0.2069	0.2069	0.2246 (22b)
Effective ac	0.5308	0.5280	0.5280	0.5239	0.5239	0.5190	0.5202	0.5179	0.5190	0.5214	0.5214	0.5252 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.9500	1.0000	1.9500		(26)					
Window (Uw = 1.20)			9.6800	1.1450	11.0840		(27)					
Heat Loss Floor 1			53.3000	0.1200	6.3960		(28a)					
External Wall 1	34.5600	11.6300	22.9300	0.1800	4.1274		(29a)					
shelterd wall	19.4400		19.4400	0.1671	3.2478		(29a)					
Total net area of external elements Aum(A, m2)			107.3000				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.8052		(33)					
Party Wall 1			31.6800	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							3.0820 (36)					
Total fabric heat loss						(33) + (36) =	29.8872 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 22.4078	Feb 22.2868	Mar 22.2868	Apr 22.1165	May 22.1165	Jun 21.9100	Jul 21.9594	Aug 21.8620	Sep 21.9100	Oct 22.0103	Nov 22.0103	Dec 22.1718 (38)
Heat transfer coeff	52.2950	52.1740	52.1740	52.0037	52.0037	51.7972	51.8466	51.7492	51.7972	51.8975	51.8975	52.0590 (39)
Average = Sum(39)m / 12 =												51.9745 (39)
HLP	Jan 0.9811	Feb 0.9789	Mar 0.9789	Apr 0.9757	May 0.9757	Jun 0.9718	Jul 0.9727	Aug 0.9709	Sep 0.9718	Oct 0.9737	Nov 0.9737	Dec 0.9767 (40)
HLP (average)												0.9751 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7874 (42)
Average daily hot water use (litres/day)												76.6508 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	84.3158	81.2498	78.1838	75.1177	72.0517	68.9857	68.9857	72.0517	75.1177	78.1838	81.2498	84.3158 (44)
Energy content (annual)	125.0380	109.3590	112.8487	98.3842	94.4020	81.4617	75.4863	86.6216	87.6562	102.1548	111.5099	121.0926 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1206.0150 (45)
Water storage loss:	18.7557	16.4038	16.9273	14.7576	14.1603	12.2193	11.3229	12.9932	13.1484	15.3232	16.7265	18.1639 (46)
Store volume												201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100 (48)
Temperature factor from Table 2b												0.5400 (49)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

Enter (49) or (54) in (55)	0.8694 (55)											
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (57)
Primary 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 (59)
Total heat required for water heating calculated for each month	151.9894	133.7022	139.8001	124.4662	121.3534	107.5437	102.4377	113.5730	113.7382	129.1062	137.5919	148.0440 (62)
Solar input	0.0000	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	151.9894	133.7022	139.8001	124.4662	121.3534	107.5437	102.4377	113.5730	113.7382	129.1062	137.5919	148.0440 (64)
Heat gains from water heating, kWh/month	41.5751	36.3619	37.5222	32.7128	31.3887	27.0860	25.0992	28.8017	29.1457	33.9665	37.0771	40.2633 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	35.4146	31.4550	25.5809	19.3664	14.4766	12.2218	13.2060	17.1657	23.0398	29.2543	34.1441	36.3989 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.5291	234.9420	228.8615	215.9169	199.5766	184.2190	173.9592	171.5463	177.6268	190.5714	206.9117	222.2693 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960 (71)
Water heating gains (Table 5)	55.8805	54.1099	50.4330	45.4344	42.1891	37.6195	33.7355	38.7119	40.4801	45.6539	51.4959	54.1173 (72)
Total internal gains	407.0841	403.7667	388.1353	363.9774	339.5021	317.3201	304.1605	310.6837	324.4065	348.7394	375.8115	396.0453 (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			9.6800	22.3313		0.6300		0.7000		0.7700		66.0635 (76)
Solar gains	66.0635	116.2483	188.7667	282.9071	337.0958	369.0130	347.6251	305.8277	237.7086	147.2013	84.3880	53.8003 (83)
Total gains	473.1475	520.0150	576.9019	646.8845	676.5978	686.3330	651.7857	616.5114	562.1151	495.9406	460.1995	449.8456 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000 (85)											
Utilisation factor for gains for living area, n1,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	70.7790	70.9431	70.9431	71.1755	71.1755	71.4593	71.3912	71.5255	71.4593	71.3212	71.3212	71.0999
alpha	5.7186	5.7295	5.7295	5.7450	5.7450	5.7640	5.7594	5.7684	5.7640	5.7547	5.7547	5.7400
util living area	0.9825	0.9692	0.9240	0.7992	0.5998	0.3765	0.2465	0.2685	0.5276	0.8448	0.9620	0.9860 (86)
MIT	20.3335	20.4553	20.6790	20.8904	20.9815	20.9989	20.9999	20.9999	20.9930	20.8747	20.5777	20.3010 (87)
Th 2	20.0991	20.1010	20.1010	20.1037	20.1037	20.1069	20.1061	20.1076	20.1069	20.1053	20.1053	20.1028 (88)
util rest of house	0.9772	0.9603	0.9035	0.7562	0.5382	0.3097	0.1755	0.1937	0.4496	0.7981	0.9492	0.9817 (89)
MIT 2	19.2417	19.4159	19.7243	19.9932	20.0896	20.1064	20.1061	20.1076	20.1031	19.9838	19.5949	19.1983 (90)
Living area fraction	19.9504	20.0906	20.3441	20.5756	20.6686	20.6858	20.6863	20.6868	20.6808	20.5621	20.2329	19.9141 (92)
MIT	19.9504	20.0906	20.3441	20.5756	20.6686	20.6858	20.6863	20.6868	20.6808	20.5621	20.2329	19.9141 (93)
Temperature adjustment	19.9504	20.0906	20.3441	20.5756	20.6686	20.6858	20.6863	20.6868	20.6808	20.5621	20.2329	19.9141 (93)
adjusted MIT	19.9504	20.0906	20.3441	20.5756	20.6686	20.6858	20.6863	20.6868	20.6808	20.5621	20.2329	19.9141 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9762	0.9602	0.9096	0.7797	0.5775	0.3531	0.2216	0.2423	0.5001	0.8233	0.9513	0.9806 (94)
Useful gains	461.8735	499.3272	524.7349	504.3484	390.7086	242.3189	144.4429	149.3601	281.1219	408.3099	437.7700	441.1210 (95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Heat loss rate W												
Month fracti	776.6021	756.0351	675.3435	555.1702	398.7931	242.7114	144.4621	149.3920	283.8887	465.1110	634.8563	771.2069 (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	234.1581	172.5077	112.0528	36.5918	6.0149	0.0000	0.0000	0.0000	0.0000	42.2667	141.9022	245.5839 (98)
Space heating												981.0779 (98)
Space heating per m2										(98) / (4) =		18.5943 (99)

8c. Space cooling requirement

Not applicable

Regs Region: England
Elmhurst Energy Systems
SAP2012 Calculator (Design
System) version 4.14r19

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

Energy saving/generation technologies			
PV Unit	-456.0399	3.0700	-1400.0425 (269)
Primary energy kwh/year			3749.0472 (272)
Primary energy kwh/m2/year			70.3386 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:	B 88
Current environmental impact rating:	B 90

(For testing purposes):

A	Not considered
B	Not considered
C	Not considered
D	Not considered
E Low energy lighting	Already installed
F	Not considered
G	Not considered
H	Not considered
I	Not considered
J	Not considered
K	Not considered
M	Not considered
N Solar water heating	Not applicable
O	Not considered
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U Solar photovoltaic panels	Not applicable
A2	Not considered
A3	Not considered
T2	Not considered
W	Not considered
X	Not considered
Y	Not considered
J2	Not considered
Q2	Not considered
Z1	Not considered
Z2	Not considered
Z3	Not considered
Z4	Not considered
Z5	Not considered
V2 Wind turbine	Not applicable
L2	Not considered
Q3	Not considered
O3	Not considered

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating:	B 88
Potential environmental impact rating:	B 90

Fuel prices for cost data on this page from database revision number 554 TEST (31 Oct 2024)
Recommendation texts revision number 4.9c (22 Feb 2014)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current £420	Potential £420	Saving £0
Electricity			
Space heating	£248	£248	£0
Water heating	£109	£109	£0
Lighting	£63	£63	£0
Generated (PV)	-£114	-£114	£0
Total cost of fuels	£306	£306	£0
Total cost of uses	£306	£306	£0
Delivered energy	23 kWh/m²	23 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.6 tonnes	0.6 tonnes	0.0 tonnes
CO2 emissions per m²	12 kg/m²	12 kg/m²	0 kg/m²
Primary energy	70 kWh/m²	70 kWh/m²	0 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	2455-06 - Flat 3	Issued on Date	05/05/2025
Assessment Reference	003	Prop Type Ref	
Property			

SAP Rating	88 B	DER	17.49	TER	25.57
Environmental	89 B	% DER<TER	31.60		
CO ₂ Emissions (t/year)	0.81	DFEE	34.62	TFEE	47.07
General Requirements Compliance	Pass	% DFEE<TFEE	26.44		

Assessor Details	Mrs. Naomi Sadler, Sadler Energy & Environmental Services Ltd, Tel: 01962 718870, naomi.sadler@sadlerenergy.co.uk	Assessor ID	4611-0001
Client	RHB PARTNERSHIP LLP , RHB		

Calculation of Heat Demand 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
Calculation of Heat Demand 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.4000 (1b)	2.4000 (2b)	173.7600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.4000		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 173.7600 (5)
Dwelling volume			

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				1 * 10 =	10.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				10.0000 / (5) =	0.0576 (8)
Pressure test				Yes	4.0000
Measured/design AP50					0.2576 (18)
Infiltration rate					2 (19)
Number of sides sheltered					
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.2189 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate	0.2299	0.2189	0.2189	0.2025	0.2025	0.1806	0.1861	0.1751	0.1806	0.1916	0.1916	0.2080 (22b)
Effective ac	0.5264	0.5240	0.5240	0.5205	0.5205	0.5163	0.5173	0.5153	0.5163	0.5183	0.5183	0.5216 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.9500	1.0000	1.9500		(26)
Window (Uw = 1.20)			13.0500	1.1450	14.9427		(27)
Heat Loss Floor 1			72.4000	0.1200	8.6880		(28a)
External Wall 1	43.4400	15.0000	28.4400	0.1800	5.1192		(29a)
shelterd wall	12.2400		12.2400	0.1671	2.0449		(29a)
Total net area of external elements Aum(A, m ²)			128.0800				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 32.7449		(33)
Party Wall 1			30.7200	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							3.4439 (36)
Total fabric heat loss						(33) + (36) =	36.1888 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	30.1853	30.0444	30.0444	29.8461	29.8461	29.6056	29.6631	29.5498	29.6056	29.7224	29.7224	29.9105 (38)
Heat transfer coeff	66.3741	66.2332	66.2332	66.0349	66.0349	65.7944	65.8519	65.7386	65.7944	65.9112	65.9112	66.0993 (39)
Average = Sum(39)m / 12 =												66.0009 (39)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF HEAT DEMAND 09 Jan 2014

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9168	0.9148	0.9148	0.9121	0.9121	0.9088	0.9096	0.9080	0.9088	0.9104	0.9104	0.9130 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kwh/year)

Assumed occupancy	2.3030 (42)											
Average daily hot water use (litres/day)	88.8951 (43)											
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content	97.7846	94.2288	90.6730	87.1172	83.5614	80.0056	80.0056	83.5614	87.1172	90.6730	94.2288	97.7846 (44)
Energy content (annual)	145.0118	126.8282	130.8754	114.1003	109.4820	94.4746	87.5446	100.4587	101.6585	118.4732	129.3228	140.4362 (45)
Distribution loss (46)m = 0.15 x (45)m	Total = Sum(45)m = 1398.6665 (45)											
Water storage loss:	21.7518	19.0242	19.6313	17.1151	16.4223	14.1712	13.1317	15.0688	15.2488	17.7710	19.3984	21.0654 (46)
Store volume	201.0000 (47)											
a) If manufacturer declared loss factor is known (kwh/day):	1.6100 (48)											
Temperature factor from Table 2b	0.5400 (49)											
Enter (49) or (54) in (55)	0.8694 (55)											
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (57)
Primary 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 (59)
Total heat required for water heating calculated for each month	171.9632	151.1714	157.8268	140.1823	136.4334	120.5566	114.4960	127.4101	127.7405	145.4246	155.4048	167.3876 (62)
Solar input	0.0000	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	171.9632	151.1714	157.8268	140.1823	136.4334	120.5566	114.4960	127.4101	127.7405	145.4246	155.4048	167.3876 (64)
RHI water heating demand	Total per year (kwh/year) = Sum(64)m = 1715.9975 (64)											
Heat gains from water heating, kwh/month	48.2164	42.1704	43.5161	37.9384	36.4028	31.4128	29.1086	33.4025	33.8015	39.3923	42.9998	46.6950 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	138.1772	138.1772	138.1772	138.1772	138.1772	138.1772	138.1772	138.1772	138.1772	138.1772	138.1772	138.1772 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	46.1619	41.0006	33.3439	25.2435	18.8698	15.9307	17.2137	22.3750	30.0317	38.1321	44.5058	47.4449 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	302.7350	305.8764	297.9601	281.1071	259.8333	239.8390	226.4815	223.3401	231.2564	248.1093	269.3831	289.3775 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.1207	51.1207	51.1207	51.1207	51.1207	51.1207	51.1207	51.1207	51.1207	51.1207	51.1207	51.1207 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181 (71)
Water heating gains (Table 5)	64.8070	62.7536	58.4893	52.6922	48.9284	43.6289	39.1244	44.8959	46.9465	52.9467	59.7220	62.7621 (72)
Total internal gains	510.8836	506.8103	486.9731	456.2225	424.8113	396.5783	379.9994	387.7907	405.4143	436.3679	470.7906	496.7643 (73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains
	m2	Table 6a	Specific data	Specific data	factor	W
		W/m2	or Table 6b	or Table 6c	Table 6d	
East	13.0500	22.3313	0.6300	0.7000	0.7700	89.0629 (76)
Solar gains	89.0629	156.7190	254.4840	381.3985	454.4524	497.4813
Total gains	599.9465	663.5293	741.4571	837.6211	879.2638	894.0596

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000 (85)											
Utilisation factor for gains for living area, n11,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	75.7491	75.9102	75.9102	76.1382	76.1382	76.4165	76.3497	76.4814	76.4165	76.2811	76.2811	76.0640
alpha	0.0499	0.0607	0.0607	0.0759	0.0759	0.0944	0.0900	0.0988	0.0944	0.0854	0.0854	0.0709
util living area	0.9856	0.9729	0.9722	0.7956	0.5897	0.3674	0.2405	0.2629	0.5207	0.8482	0.9668	0.9888 (86)
MIT	20.3713	20.4925	20.7110	20.9097	20.9867	20.9994	21.0000	20.9999	20.9951	20.8900	20.6043	20.3383 (87)
Th 2	20.1533	20.1549	20.1549	20.1572	20.1572	20.1601	20.1594	20.1607	20.1601	20.1587	20.1587	20.1565 (88)
util rest of house	0.9812	0.9651	0.9079	0.7539	0.5317	0.3060	0.1753	0.1940	0.4477	0.8035	0.9556	0.9853 (89)
MIT 2	19.3388	19.5125	19.8142	20.0662	20.1471	20.1598	20.1594	20.1607	20.1573	20.0514	19.6763	19.2941 (90)
Living area fraction	19.7909	19.9416	20.2068	20.4355	20.5147	20.5274	20.5274	20.5282	20.5241	20.4185	20.0827	19.7513 (92)
MIT	fLA = Living area / (4) = 0.4378 (91)											
Temperature adjustment	0.0000											

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF HEAT DEMAND 09 Jan 2014

adjusted MIT 19.7909 19.9416 20.2068 20.4355 20.5147 20.5274 20.5274 20.5282 20.5241 20.4185 20.0827 19.7513 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9789	0.9628	0.9092	0.7683	0.5566	0.3329	0.2039	0.2241	0.4796	0.8183	0.9544	0.9832 (94)
Useful gains	587.3133	638.8294	674.1143	643.5217	489.4264	297.6318	173.0125	179.3300	348.1481	519.4986	557.8926	559.7474 (95)
Ext temp.	5.1000	5.6000	7.4000	9.0000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Heat loss rate W	975.0952	949.8910	848.2374	695.7094	496.2341	297.8768	173.0210	179.3452	350.2975	581.2410	796.3822	968.4417 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	288.5097	209.0335	129.5476	37.5752	5.0650	0.0000	0.0000	0.0000	0.0000	45.9363	171.7125	304.0686 (98)
Space heating												1191.4483 (98)
RHI space heating demand												1191 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.4000 (1b)	x 2.4000 (2b)	= 173.7600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.4000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 173.7600 (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				1 * 10 =	10.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				10.0000 / (5) = 0.0576 (8)
Pressure test					Yes
Measured/design AP50					4.0000
Infiltration rate					0.2576 (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) =				0.2189 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infiltr rate	0.2791	0.2736	0.2682	0.2408	0.2353	0.2080	0.2080	0.2025	0.2189	0.2353	0.2463	0.2572 (22b)
Effective ac	0.5390	0.5374	0.5360	0.5290	0.5277	0.5216	0.5216	0.5205	0.5240	0.5277	0.5303	0.5331 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.9500	1.0000	1.9500		(26)					
Window (Uw = 1.20)			13.0500	1.1450	14.9427		(27)					
Heat Loss Floor 1			72.4000	0.1200	8.6880		(28a)					
External Wall 1	43.4400	15.0000	28.4400	0.1800	5.1192		(29a)					
shelterd wall	12.2400		12.2400	0.1671	2.0449		(29a)					
Total net area of external elements Aum(A, m2)			128.0800				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.7449		(33)					
Party Wall 1			30.7200	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							3.4439 (36)					
Total fabric heat loss						(33) + (36) =	36.1888 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 30.9041	Feb 30.8173	Mar 30.7323	Apr 30.3330	May 30.2583	Jun 29.9105	Jul 29.9105	Aug 29.8461	Sep 30.0444	Oct 30.2583	Nov 30.4094	Dec 30.5674 (38)
Heat transfer coeff	67.0929	67.0061	66.9211	66.5218	66.4471	66.0993	66.0993	66.0349	66.2332	66.4471	66.5982	66.7562 (39)
Average = Sum(39)m / 12 =												66.5214 (39)
HLP	Jan 0.9267	Feb 0.9255	Mar 0.9243	Apr 0.9188	May 0.9178	Jun 0.9130	Jul 0.9130	Aug 0.9121	Sep 0.9148	Oct 0.9178	Nov 0.9199	Dec 0.9220 (40)
HLP (average)												0.9188 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3030 (42)
Average daily hot water use (litres/day)												88.8951 (43)
Daily hot water use	Jan 97.7846	Feb 94.2288	Mar 90.6730	Apr 87.1172	May 83.5614	Jun 80.0056	Jul 80.0056	Aug 83.5614	Sep 87.1172	Oct 90.6730	Nov 94.2288	Dec 97.7846 (44)
Energy conte	145.0118	126.8282	130.8754	114.1003	109.4820	94.4746	87.5446	100.4587	101.6585	118.4732	129.3228	140.4362 (45)
Energy content (annual)												Total = Sum(45)m = 1398.6665 (45)
Distribution loss	21.7518	19.0242	19.6313	17.1151	16.4223	14.1712	13.1317	15.0688	15.2488	17.7710	19.3984	21.0654 (46)
Water storage loss:												201.0000 (47)
Store volume												1.6100 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

Enter (49) or (54) in (55)												0.8694 (55)	
Total storage loss													
26.9514 24.3432 26.9514 26.0820 26.9514 26.0820 26.9514 26.9514 26.0820 26.9514 26.0820 26.9514 (56)													
If cylinder contains dedicated solar storage													
26.9514 24.3432 26.9514 26.0820 26.9514 26.0820 26.9514 26.9514 26.0820 26.9514 26.0820 26.9514 (57)													
Primary 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 (59)													
Total heat required for water heating calculated for each month													
171.9632 151.1714 157.8268 140.1823 136.4334 120.5566 114.4960 127.4101 127.7405 145.4246 155.4048 167.3876 (62)													
Solar input 0.0000 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													
171.9632 151.1714 157.8268 140.1823 136.4334 120.5566 114.4960 127.4101 127.7405 145.4246 155.4048 167.3876 (64)													
Heat gains from water heating, kWh/month													
48.2164 42.1704 43.5161 37.9384 36.4028 31.4128 29.1086 33.4025 33.8015 39.3923 42.9998 46.6950 (65)													

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	138.1772	138.1772	138.1772	138.1772	138.1772	138.1772	138.1772	138.1772	138.1772	138.1772	138.1772	138.1772	138.1772 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	46.1619	41.0006	33.3439	25.2435	18.8698	15.9307	17.2137	22.3750	30.0317	38.1321	44.5058	47.4449	47.4449 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	302.7350	305.8764	297.9601	281.1071	259.8333	239.8390	226.4815	223.3401	231.2564	248.1093	269.3831	289.3775	289.3775 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.1207	51.1207	51.1207	51.1207	51.1207	51.1207	51.1207	51.1207	51.1207	51.1207	51.1207	51.1207	51.1207 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181 (71)
Water heating gains (Table 5)	64.8070	62.7536	58.4893	52.6922	48.9284	43.6289	39.1244	44.8959	46.9465	52.9467	59.7220	62.7621	62.7621 (72)
Total internal gains	510.8836	506.8103	486.9731	456.2225	424.8113	396.5783	379.9994	387.7907	405.4143	436.3679	470.7906	496.7643	496.7643 (73)

6. Solar gains

[Jan]	Area m2		Solar Flux Table 6a W/m2		Specific data or Table 6b		Specific data or Table 6c		Access factor Table 6d		Gains W	
East	13.0500		19.6403		0.6300		0.7000		0.7700		78.3303 (76)	
Solar gains	78.3303	153.2306	252.3490	368.0360	451.0420	461.7217	439.5779	377.5909	293.4924	181.8211	97.6686	64.4150 (83)
Total gains	589.2139	660.0409	739.3221	824.2586	875.8533	858.3000	819.5772	765.3816	698.9066	618.1889	568.4593	561.1793 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, n11,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	74.9376	75.0346	75.1299	75.5809	75.6659	76.0640	76.0640	76.1382	75.9102	75.6659	75.4942	75.3155
alpha	5.9958	6.0023	6.0087	6.0387	6.0444	6.0709	6.0709	6.0759	6.0607	6.0444	6.0329	6.0210
util living area	0.9898	0.9790	0.9454	0.8475	0.6780	0.4894	0.3544	0.3960	0.6357	0.9011	0.9790	0.9922 (86)
MIT	20.2736	20.4149	20.6329	20.8560	20.9673	20.9960	20.9995	20.9991	20.9828	20.8185	20.5001	20.2358 (87)
Th 2	20.1449	20.1459	20.1469	20.1515	20.1524	20.1565	20.1565	20.1572	20.1549	20.1524	20.1506	20.1488 (88)
util rest of house	0.9868	0.9730	0.9307	0.8134	0.6248	0.4265	0.2867	0.3239	0.5652	0.8691	0.9719	0.9899 (89)
MIT 2	19.1910	19.3944	19.7008	19.9968	20.1239	20.1541	20.1563	20.1569	20.1430	19.9591	19.5227	19.1395 (90)
Living area fraction	19.6650	19.8412	20.1089	20.3730	20.4932	20.5227	20.5255	20.5256	fLA = Living area / (4) =	20.5107	20.3354	19.4378 (91)
MIT	19.6650	19.8412	20.1089	20.3730	20.4932	20.5227	20.5255	20.5256	20.5107	20.3354	19.9506	19.6195 (92)
Temperature adjustment												0.0000
adjusted MIT	19.6650	19.8412	20.1089	20.3730	20.4932	20.5227	20.5255	20.5256	20.5107	20.3354	19.9506	19.6195 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	589.2124	640.5372	687.5663	678.2792	566.4114	389.6662	259.3089	272.1061	416.2238	541.9976	551.3225	554.4678	554.4678 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	4.2000 (96)
Heat loss rate W	1030.8832	1001.1545	910.7219	763.2065	584.2806	391.4867	259.4736	272.4363	424.6010	646.8882	855.8291	1029.3469	1029.3469 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	335.2990	242.3348	166.0277	61.1476	13.2947	0.0000	0.0000	0.0000	0.0000	78.0387	219.2447	353.3101	353.3101 (98)
Space heating													1468.6974 (98)
Space heating per m ²													20.2859 (99)
													(98) / (4) =

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 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)
Fraction of main heating from main system 2													0.0000	(203)
Fraction of total heating from main system 1													1.0000	(204)
Fraction of total heating from main system 2													0.0000	(205)
Efficiency of main space heating system 1 (in %)													100.0000	(206)
Efficiency of main space heating system 2 (in %)													0.0000	(207)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													1468.6974	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	335.2990	242.3348	166.0277	61.1476	13.2947	0.0000	0.0000	0.0000	0.0000	78.0387	219.2447	353.3101	(98)	
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)	
Space heating fuel (main heating system)	335.2990	242.3348	166.0277	61.1476	13.2947	0.0000	0.0000	0.0000	0.0000	78.0387	219.2447	353.3101	(211)	
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)	
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)	
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)	
Space heating fuel used, main system 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)	
Water heating requirement	171.9632	151.1714	157.8268	140.1823	136.4334	120.5566	114.4960	127.4101	127.7405	145.4246	155.4048	167.3876	(64)	
Efficiency of water heater (217)m	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	(216)	
Fuel for water heating, kWh/month	49.2153	43.2648	45.1695	40.1197	39.0468	34.5029	32.7684	36.4644	36.5589	41.6201	44.4763	47.9058	(219)	
Water heating fuel used	49.2153	43.2648	45.1695	40.1197	39.0468	34.5029	32.7684	36.4644	36.5589	41.6201	44.4763	47.9058	(219)	
Annual totals kWh/year														
Space heating fuel - main system													1468.6974	(211)
Space heating fuel - secondary													0.0000	(215)
Electricity for pumps and fans:														
Total electricity for the above, kWh/year													0.0000	(231)
Electricity for lighting (calculated in Appendix L)													326.0936	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 0.50 * 1080 * 1.00) =													-431.8098	(233)
Total delivered energy for all uses													1854.0940	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1468.6974	13.1900	193.7212 (240)
Space heating - main system 2	0.0000	13.1900	0.0000 (241)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	491.1129	13.1900	64.7778 (247)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Energy for lighting	326.0936	13.1900	43.0117 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit	-431.8098	13.1900	-56.9557 (252)
Total energy cost			244.5550 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.8749 (257)
SAP value		87.7952
SAP rating (Section 12)		88 (258)
SAP band		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1468.6974	0.5190	762.2539 (261)
Space heating - main system 2	0.0000	0.5190	0.0000 (262)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	491.1129	0.5190	254.8876 (264)
Space and water heating			1017.1415 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	326.0936	0.5190	169.2426 (268)
Energy saving/generation technologies			
PV Unit	-431.8098	0.5190	-224.1093 (269)
Total kg/year			962.2748 (272)
CO2 emissions per m2			13.2900 (273)
EI value			89.0166
EI rating			89 (274)
EI band			B

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

Calculation of stars for heating and DHW

Main heating 1 energy efficiency	$13.19 \times (1 + 0.29 \times 0.00) / 1.0000 = 13.190$, stars = 1
Main heating 2 energy efficiency	(does water heating only)
Main heating 1 environmental impact	$0.519 \times (1 + 0.29 \times 0.00) / 1.0000 = 0.5190$, stars = 2
Main heating 2 environmental impact	(does water heating only)
Water heating energy efficiency	$13.19 / 3.4941 = 3.775$, stars = 5
Water heating environmental impact	$0.519 / 3.4941 = 0.1485$, stars = 5

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.4000 (1b)	x 2.4000 (2b)	= 173.7600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.4000		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 173.7600 (5)
Dwelling volume			

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				1 * 10 =	10.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				10.0000 / (5) =	0.0576 (8)
Pressure test					Yes
Measured/design AP50					4.0000
Infiltration rate					0.2576 (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) =	0.2189 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate	0.2299	0.2189	0.2189	0.2025	0.2025	0.1806	0.1861	0.1751	0.1806	0.1916	0.1916	0.2080 (22b)
Effective ac	0.5264	0.5240	0.5240	0.5205	0.5205	0.5163	0.5173	0.5153	0.5163	0.5183	0.5183	0.5216 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K					
Door			1.9500	1.0000	1.9500		(26)					
Window (Uw = 1.20)			13.0500	1.1450	14.9427		(27)					
Heat Loss Floor 1			72.4000	0.1200	8.6880		(28a)					
External Wall 1	43.4400	15.0000	28.4400	0.1800	5.1192		(29a)					
shelterd wall	12.2400		12.2400	0.1671	2.0449		(29a)					
Total net area of external elements Aum(A, m ²)			128.0800				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.7449		(33)					
Party Wall 1			30.7200	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							3.4439 (36)					
Total fabric heat loss						(33) + (36) =	36.1888 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 30.1853	Feb 30.0444	Mar 30.0444	Apr 29.8461	May 29.8461	Jun 29.6056	Jul 29.6631	Aug 29.5498	Sep 29.6056	Oct 29.7224	Nov 29.7224	Dec 29.9105 (38)
Heat transfer coeff	66.3741	66.2332	66.2332	66.0349	66.0349	65.7944	65.8519	65.7386	65.7944	65.9112	65.9112	66.0993 (39)
Average = Sum(39)m / 12 =												66.0009 (39)
HLP	Jan 0.9168	Feb 0.9148	Mar 0.9148	Apr 0.9121	May 0.9121	Jun 0.9088	Jul 0.9096	Aug 0.9080	Sep 0.9088	Oct 0.9104	Nov 0.9104	Dec 0.9130 (40)
HLP (average)												0.9116 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3030 (42)
Average daily hot water use (litres/day)												88.8951 (43)
Daily hot water use	97.7846	94.2288	99.6730	87.1172	83.5614	80.0056	80.0056	83.5614	87.1172	99.6730	94.2288	97.7846 (44)
Energy conte	145.0118	126.8282	130.8754	114.1003	109.4820	94.4746	87.5446	100.4587	101.6585	118.4732	129.3228	140.4362 (45)
Energy content (annual)										Total = Sum(45)m =		1398.6665 (45)
Distribution loss	21.7518	19.0242	19.6313	17.1151	16.4223	14.1712	13.1317	15.0688	15.2488	17.7710	19.3984	21.0654 (46)
Water storage loss:												
Store volume												201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100 (48)
Temperature factor from Table 2b												0.5400 (49)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

Enter (49) or (54) in (55)												0.8694 (55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (57)
Primary 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 (59)
Total heat required for water heating calculated for each month	171.9632	151.1714	157.8268	140.1823	136.4334	120.5566	114.4960	127.4101	127.7405	145.4246	155.4048	167.3876 (62)
Solar input	0.0000	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	171.9632	151.1714	157.8268	140.1823	136.4334	120.5566	114.4960	Solar input (sum of months) = Sum(63)m =				0.0000 (63)
Heat gains from water heating, kWh/month	48.2164	42.1704	43.5161	37.9384	36.4028	31.4128	29.1086	33.4025	33.8015	39.3923	42.9998	46.6950 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	138.1772	138.1772	138.1772	138.1772	138.1772	138.1772	138.1772	138.1772	138.1772	138.1772	138.1772	138.1772	138.1772 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	46.1619	41.0006	33.3439	25.2435	18.8698	15.9307	17.2137	22.3750	30.0317	38.1321	44.5058	47.4449	47.4449 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	302.7350	305.8764	297.9601	281.1071	259.8333	239.8390	226.4815	223.3401	231.2564	248.1093	269.3831	289.3775	289.3775 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.1207	51.1207	51.1207	51.1207	51.1207	51.1207	51.1207	51.1207	51.1207	51.1207	51.1207	51.1207	51.1207 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181 (71)
Water heating gains (Table 5)	64.8070	62.7536	58.4893	52.6922	48.9284	43.6289	39.1244	44.8959	46.9465	52.9467	59.7220	62.7621	62.7621 (72)
Total internal gains	510.8836	506.8103	486.9731	456.2225	424.8113	396.5783	379.9994	387.7907	405.4143	436.3679	470.7906	496.7643	496.7643 (73)

6. Solar gains

[Jan]	Area m2		Solar Flux Table 6a W/m2		Specific data or Table 6b		Specific data or Table 6c		Access factor Table 6d		Gains W	
East	13.0500		22.3313		0.6300		0.7000		0.7700		89.0629 (76)	
Solar gains	89.0629	156.7190	254.4840	381.3985	454.4524	497.4813	468.6475	412.2987	320.4646	198.4480	113.7669	72.5303 (83)
Total gains	599.9465	663.5293	741.4571	837.6211	879.2638	894.0596	848.6469	800.0894	725.8788	634.8158	584.5575	569.2946 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, n1,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	75.7491	75.9102	75.9102	76.1382	76.1382	76.4165	76.3497	76.4814	76.4165	76.2811	76.2811	76.0640
alpha	6.0499	6.0607	6.0607	6.0759	6.0759	6.0944	6.0900	6.0988	6.0944	6.0854	6.0854	6.0709
util living area	0.9856	0.9729	0.9272	0.7956	0.5897	0.3674	0.2405	0.2629	0.5207	0.8482	0.9668	0.9888 (86)
MIT	20.3713	20.4925	20.7110	20.9097	20.9867	20.9994	21.0000	20.9999	20.9951	20.8900	20.6043	20.3383 (87)
Th 2	20.1533	20.1549	20.1549	20.1572	20.1572	20.1601	20.1594	20.1607	20.1601	20.1587	20.1587	20.1565 (88)
util rest of house	0.9812	0.9651	0.9079	0.7539	0.5317	0.3060	0.1753	0.1940	0.4477	0.8035	0.9556	0.9853 (89)
MIT 2	19.3388	19.5125	19.8142	20.0662	20.1471	20.1598	20.1594	20.1607	20.1573	20.0514	19.6763	19.2941 (90)
Living area fraction	19.7909	19.9416	20.2068	20.4355	20.5147	20.5274	20.5274	20.5282	fLA = Living area / (4) =	20.5241	20.4185	20.0827
MIT	19.7909	19.9416	20.2068	20.4355	20.5147	20.5274	20.5274	20.5282	20.5241	20.4185	20.0827	19.7513 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7909	19.9416	20.2068	20.4355	20.5147	20.5274	20.5274	20.5282	20.5241	20.4185	20.0827	19.7513 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9789	0.9628	0.9092	0.7683	0.5566	0.3329	0.2039	0.2241	0.4796	0.8183	0.9544	0.9832 (94)
Useful gains	587.3133	638.8294	674.1143	643.5217	489.4264	297.6318	173.0125	179.3300	348.1481	519.4986	557.8926	559.7474 (95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Heat loss rate W	975.0952	949.8910	848.2374	695.7094	496.2341	297.8768	173.0210	179.3452	350.2975	581.2410	796.3822	968.4417 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	288.5097	209.0335	129.5476	37.5752	5.0650	0.0000	0.0000	0.0000	0.0000	45.9363	171.7125	304.0686 (98)
Space heating												1191.4483 (98)
Space heating per m2												16.4565 (99)
										(98) / (4) =		

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 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)
Fraction of main heating from main system 2													0.0000	(203)
Fraction of total heating from main system 1													1.0000	(204)
Fraction of total heating from main system 2													0.0000	(205)
Efficiency of main space heating system 1 (in %)													100.0000	(206)
Efficiency of main space heating system 2 (in %)													0.0000	(207)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													1191.4483	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	288.5097	209.0335	129.5476	37.5752	5.0650	0.0000	0.0000	0.0000	0.0000	45.9363	171.7125	304.0686	(98)	
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)	
Space heating fuel (main heating system)	288.5097	209.0335	129.5476	37.5752	5.0650	0.0000	0.0000	0.0000	0.0000	45.9363	171.7125	304.0686	(211)	
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)	
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)	
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)	
Space heating fuel used, main system 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)	
Water heating requirement	171.9632	151.1714	157.8268	140.1823	136.4334	120.5566	114.4960	127.4101	127.7405	145.4246	155.4048	167.3876	(64)	
Efficiency of water heater (217)m	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	(216)	
Fuel for water heating, kWh/month	49.2153	43.2648	45.1695	40.1197	39.0468	34.5029	32.7684	36.4644	36.5589	41.6201	44.4763	47.9058	(219)	
Water heating fuel used												491.1129	(219)	
Annual totals kWh/year														
Space heating fuel - main system												1191.4483	(211)	
Space heating fuel - secondary												0.0000	(215)	
Electricity for pumps and fans:														
Total electricity for the above, kWh/year												0.0000	(231)	
Electricity for lighting (calculated in Appendix L)												326.0936	(232)	
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 0.50 * 1140 * 1.00) =										-456.0399		-456.0399	(233)	
Total delivered energy for all uses												1552.6149	(238)	

10a. Fuel costs - using BEDF prices (554)

	Fuel	Fuel price	Fuel cost
	kWh/year	p/kWh	£/year
Space heating - main system 1	1191.4483	25.0500	298.4578 (240)
Space heating - main system 2	0.0000	25.0500	0.0000 (241)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	491.1129	25.0500	123.0238 (247)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Energy for lighting	326.0936	25.0500	81.6864 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit	-456.0399	25.0500	-114.2380 (252)
Total energy cost			388.9300 (255)

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

	Energy	Emission factor	Emissions
	kWh/year	kg CO2/kWh	kg CO2/year
Space heating - main system 1	1191.4483	0.5190	618.3617 (261)
Space heating - main system 2	0.0000	0.5190	0.0000 (262)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	491.1129	0.5190	254.8876 (264)
Space and water heating			873.2493 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	326.0936	0.5190	169.2426 (268)
Energy saving/generation technologies			
PV Unit	-456.0399	0.5190	-236.6847 (269)
Total kg/year			805.8071 (272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy	Primary energy factor	Primary energy
	kWh/year	kg CO2/kWh	kWh/year
Space heating - main system 1	1191.4483	3.0700	3657.7463 (261)
Space heating - main system 2	0.0000	3.0700	0.0000 (262)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	491.1129	3.0700	1507.7165 (264)
Space and water heating			5165.4629 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	326.0936	3.0700	1001.1073 (268)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

Energy saving/generation technologies	-456.0399	3.0700	-1400.0425 (269)
PV Unit			4766.5276 (272)
Primary energy kwh/year			65.8360 (273)
Primary energy kwh/m2/year			

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 88
Current environmental impact rating: B 89

(For testing purposes):

A	Not considered
B	Not considered
C	Not considered
D	Not considered
E Low energy lighting	Already installed
F	Not considered
G	Not considered
H	Not considered
I	Not considered
J	Not considered
K	Not considered
M	Not considered
N Solar water heating	Not applicable
O	Not considered
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U Solar photovoltaic panels	Not applicable
A2	Not considered
A3	Not considered
T2	Not considered
W	Not considered
X	Not considered
Y	Not considered
J2	Not considered
Q2	Not considered
Z1	Not considered
Z2	Not considered
Z3	Not considered
Z4	Not considered
Z5	Not considered
V2 Wind turbine	Not applicable
L2	Not considered
Q3	Not considered
O3	Not considered

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 88
Potential environmental impact rating: B 89

Fuel prices for cost data on this page from database revision number 554 TEST (31 Oct 2024)
Recommendation texts revision number 4.9c (22 Feb 2014)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current £503	Potential £503	Saving £0
Electricity			
Space heating	£298	£298	£0
Water heating	£123	£123	£0
Lighting	£82	£82	£0
Generated (PV)	-£114	-£114	£0
Total cost of fuels	£389	£389	£0
Total cost of uses	£389	£389	£0
Delivered energy	21 kWh/m²	21 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.8 tonnes	0.8 tonnes	0.0 tonnes
CO2 emissions per m²	11 kg/m²	11 kg/m²	0 kg/m²
Primary energy	66 kWh/m²	66 kWh/m²	0 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	2455-06- Flat 4	Issued on Date	05/05/2025
Assessment Reference	004	Prop Type Ref	
Property			

SAP Rating	87 B	DER	18.85	TER	26.53
Environmental	88 B	% DER<TER	28.95		
CO ₂ Emissions (t/year)	0.83	DFEE	35.82	TFEE	49.01
General Requirements Compliance	Pass	% DFEE<TFEE	26.91		

Assessor Details	Mrs. Naomi Sadler, Sadler Energy & Environmental Services Ltd, Tel: 01962 718870, naomi.sadler@sadlerenergy.co.uk	Assessor ID	4611-0001
Client	RHB PARTNERSHIP LLP , RHB		

Calculation of Heat Demand 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
Calculation of Heat Demand 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	68.3000 (1b)	2.4000 (2b)	163.9200 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.3000		
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 163.9200 (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) =	0.1220 (8)
Pressure test				Yes	
Measured/design AP50				4.0000	
Infiltration rate				0.3220 (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) =	0.2737 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate												
Effective ac	0.2874	0.2737	0.2737	0.2532	0.2532	0.2258	0.2327	0.2190	0.2258	0.2395	0.2395	0.2600 (22b)
	0.5413	0.5375	0.5375	0.5321	0.5321	0.5255	0.5271	0.5240	0.5255	0.5287	0.5287	0.5338 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.9500	1.0000	1.9500		(26)
Window (Uw = 1.20)			13.0500	1.1450	14.9427		(27)
Heat Loss Floor 1			68.3000	0.1200	8.1960		(28a)
External Wall 1	44.1600	15.0000	29.1600	0.1800	5.2488		(29a)
shelterd wall	11.5200		11.5200	0.1671	1.9246		(29a)
External Roof 1	12.3000		12.3000	0.0900	1.1070		(30)
Total net area of external elements Aum(A, m ²)			136.2800				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	33.3692	(33)
Party Wall 1			31.9200	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							3.8416 (36)
Total fabric heat loss						(33) + (36) =	37.2108 (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	29.2807	29.0731	29.0731	28.7805	28.7805	28.4259	28.5108	28.3436	28.4259	28.5982	28.5982	28.8755 (38)
Heat transfer coeff	66.4916	66.2839	66.2839	65.9913	65.9913	65.6367	65.7216	65.5544	65.6367	65.8090	65.8090	66.0863 (39)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF HEAT DEMAND 09 Jan 2014

Average = Sum(39)m / 12 = 65.9413 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9735	0.9705	0.9705	0.9662	0.9662	0.9610	0.9622	0.9598	0.9610	0.9635	0.9635	0.9676 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kwh/year)

Assumed occupancy 2.2042 (42)
Average daily hot water use (litres/day) 86.5487 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	95.2036	91.7416	88.2797	84.8177	81.3558	77.8938	77.8938	81.3558	84.8177	88.2797	91.7416	95.2036 (44)
Energy content (annual)	141.1841	123.4805	127.4208	111.0886	106.5921	91.9809	85.2338	97.8071	98.9752	115.3461	125.9092	136.7293 (45)
Distribution loss (46)m = 0.15 x (45)m	21.1776	18.5221	19.1131	16.6633	15.9888	13.7971	12.7851	14.6711	14.8463	17.3019	18.8864	20.5094 (46)
Water storage loss:												
Store volume												201.0000 (47)
a) If manufacturer declared loss factor is known (kwh/day):												1.6100 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8694 (55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (57)
Primary 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 (59)
Total heat required for water heating calculated for each month	168.1355	147.8237	154.3722	137.1706	133.5435	118.0629	112.1852	124.7585	125.0572	142.2975	151.9912	163.6807 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	168.1355	147.8237	154.3722	137.1706	133.5435	118.0629	112.1852	124.7585	125.0572	142.2975	151.9912	163.6807 (64)
RHI water heating demand												1679.0788 (64)
Heat gains from water heating, kwh/month	46.9437	41.0573	42.3674	36.9370	35.4419	30.5837	28.3403	32.5209	32.9093	38.3526	41.8648	45.4625 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	132.2493	132.2493	132.2493	132.2493	132.2493	132.2493	132.2493	132.2493	132.2493	132.2493	132.2493	132.2493 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	43.6198	38.7427	31.5077	23.8533	17.8306	15.0534	16.2657	21.1428	28.3778	36.0321	42.0548	44.8321 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	288.5034	291.4972	283.9530	267.8923	247.6186	228.5641	215.8346	212.8408	220.3850	236.4457	256.7194	275.7739 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.4291	50.4291	50.4291	50.4291	50.4291	50.4291	50.4291	50.4291	50.4291	50.4291	50.4291	50.4291 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-88.1662	-88.1662	-88.1662	-88.1662	-88.1662	-88.1662	-88.1662	-88.1662	-88.1662	-88.1662	-88.1662	-88.1662 (71)
Water heating gains (Table 5)	63.0964	61.0971	56.9455	51.3013	47.6369	42.4773	38.0917	43.7108	45.7073	51.5491	58.1456	61.1055 (72)
Total internal gains	489.7317	485.8492	466.9183	437.5591	407.5984	380.6070	364.7042	372.2066	388.9823	418.5392	451.4320	476.2236 (73)

6. Solar gains

[Jan]			Area m2		Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W	
West			13.0500		22.3313		0.6300		0.7000		0.7700		89.0629 (80)	
Solar gains			89.0629	156.7190	254.4840	381.3985	454.4524	497.4813	468.6475	412.2987	320.4646	198.4480	113.7669	72.5303 (83)
Total gains			578.7946	642.5682	721.4023	818.9577	862.0568	878.0883	833.3518	784.5053	709.4469	616.9871	565.1989	548.7539 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, n11,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	71.3332	71.5567	71.5567	71.8739	71.8739	72.2622	72.1689	72.3529	72.2622	72.0731	72.0731	71.7706
alpha	5.7555	5.7704	5.7704	5.7916	5.7916	5.8175	5.8113	5.8235	5.8175	5.8049	5.8049	5.7847
util living area	0.9856	0.9732	0.9291	0.8013	0.5980	0.3730	0.2444	0.2673	0.5299	0.8542	0.9675	0.9887 (86)
MIT	20.3085	20.4379	20.6713	20.8915	20.9824	20.9990	20.9999	20.9999	20.9932	20.8696	20.5606	20.2772 (87)
Th 2	20.1055	20.1080	20.1080	20.1116	20.1116	20.1160	20.1149	20.1170	20.1160	20.1138	20.1138	20.1104 (88)
util rest of house	0.9812	0.9653	0.9097	0.7586	0.5370	0.3074	0.1747	0.1936	0.4523	0.8090	0.9563	0.9852 (89)
MIT 2	19.2111	19.3973	19.7205	20.0020	20.0982	20.1155	20.1149	20.1169	20.1122	19.9863	19.5786	19.1702 (90)
Living area fraction									FLA = Living area	/ (4) =		0.4641 (91)
MIT	19.7204	19.8803	20.1618	20.4149	20.5086	20.5256	20.5257	20.5268	20.5211	20.3963	20.0344	19.6840 (92)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF HEAT DEMAND 09 Jan 2014

Temperature adjustment												0.0000
adjusted MIT	19.7204	19.8803	20.1618	20.4149	20.5086	20.5256	20.5257	20.5268	20.5211	20.3963	20.0344	19.6840 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9789	0.9630	0.9110	0.7739	0.5647	0.3379	0.2071	0.2278	0.4882	0.8245	0.9551	0.9831 (94)
Useful gains	566.5856	618.7651	657.1779	633.8112	486.7699	296.6865	172.5489	178.7256	346.3627	508.7189	539.8057	539.4619 (95)
Ext temp.	5.1000	5.6000	7.4000	9.0000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Heat loss rate W	972.1357	946.5515	845.9032	693.8892	495.5007	297.0458	172.5634	178.7506	349.2585	578.8747	791.9708	963.8002 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	301.7293	220.2724	140.4116	43.2562	6.4957	0.0000	0.0000	0.0000	0.0000	52.1960	181.5589	315.7077 (98)
Space heating												1261.6278 (98)
RHI space heating demand												1262 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	68.3000 (1b)	2.4000 (2b)	163.9200 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.3000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	163.9200 (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) = 0.1220 (8)
Pressure test					Yes
Measured/design AP50					4.0000
Infiltration rate					0.3220 (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) =				0.2737 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infiltr rate	0.3490	0.3421	0.3353	0.3011	0.2942	0.2600	0.2600	0.2532	0.2737	0.2942	0.3079	0.3216 (22b)
Effective ac	0.5609	0.5585	0.5562	0.5453	0.5433	0.5338	0.5338	0.5321	0.5375	0.5433	0.5474	0.5517 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.9500	1.0000	1.9500		(26)					
Window (Uw = 1.20)			13.0500	1.1450	14.9427		(27)					
Heat Loss Floor 1			68.3000	0.1200	8.1960		(28a)					
External Wall 1	44.1600	15.0000	29.1600	0.1800	5.2488		(29a)					
shelterd wall	11.5200		11.5200	0.1671	1.9246		(29a)					
External Roof 1	12.3000		12.3000	0.0900	1.1070		(30)					
Total net area of external elements Aum(A, m2)			136.2800				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		33.3692		(33)					
Party Wall 1			31.9200	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							3.8416 (36)					
Total fabric heat loss						(33) + (36) =	37.2108 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 30.3407	Feb 30.2128	Mar 30.0875	Apr 29.4986	May 29.3884	Jun 28.8755	Jul 28.8755	Aug 28.7805	Sep 29.0731	Oct 29.3884	Nov 29.6113	Dec 29.8443 (38)
Heat transfer coeff	67.5516	67.4236	67.2983	66.7094	66.5992	66.0863	66.0863	65.9913	66.2839	66.5992	66.8221	67.0551 (39)
Average = Sum(39)m / 12 =												66.7089 (39)
HLP	Jan 0.9890	Feb 0.9872	Mar 0.9853	Apr 0.9767	May 0.9751	Jun 0.9676	Jul 0.9676	Aug 0.9662	Sep 0.9705	Oct 0.9751	Nov 0.9784	Dec 0.9818 (40)
HLP (average)												0.9767 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2042 (42)
Average daily hot water use (litres/day)												86.5487 (43)
Daily hot water use	95.2036	91.7416	88.2797	84.8177	81.3558	77.8938	77.8938	81.3558	84.8177	88.2797	91.7416	95.2036 (44)
Energy conte	141.1841	123.4805	127.4208	111.0886	106.5921	91.9809	85.2338	97.8071	98.9752	115.3461	125.9092	136.7293 (45)
Energy content (annual)										Total = Sum(45)m =		1361.7478 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.1776	18.5221	19.1131	16.6633	15.9888	13.7971	12.7851	14.6711	14.8463	17.3019	18.8864	20.5094 (46)
Water storage loss:												
Store volume												201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100 (48)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 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)
Fraction of main heating from main system 2													0.0000 (203)
Fraction of total heating from main system 1													1.0000 (204)
Fraction of total heating from main system 2													0.0000 (205)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1560.9955 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	351.7607	256.6815	180.0250	69.4497	16.4916	0.0000	0.0000	0.0000	0.0000	87.0746	231.6892	367.8232	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	351.7607	256.6815	180.0250	69.4497	16.4916	0.0000	0.0000	0.0000	0.0000	87.0746	231.6892	367.8232	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Water heating requirement	168.1355	147.8237	154.3722	137.1706	133.5435	118.0629	112.1852	124.7585	125.0572	142.2975	151.9912	163.6807	(64)
Efficiency of water heater (217)m	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	(216)
Fuel for water heating, kWh/month	48.1198	42.3067	44.1808	39.2578	38.2197	33.7892	32.1070	35.7055	35.7910	40.7251	43.4994	46.8449	(219)
Water heating fuel used												480.5469	(219)
Annual totals kWh/year													
Space heating fuel - main system												1560.9955	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												308.1355	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.50 * 1080 * 1.00) =												-431.8098	(233)
Total delivered energy for all uses												1917.8680	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1560.9955	13.1900	205.8953 (240)
Space heating - main system 2	0.0000	13.1900	0.0000 (241)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	480.5469	13.1900	63.3841 (247)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Energy for lighting	308.1355	13.1900	40.6431 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit	-431.8098	13.1900	-56.9557 (252)
Total energy cost			252.9668 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.9377 (257)
SAP value		86.9185
SAP rating (Section 12)		87 (258)
SAP band		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1560.9955	0.5190	810.1567 (261)
Space heating - main system 2	0.0000	0.5190	0.0000 (262)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	480.5469	0.5190	249.4038 (264)
Space and water heating			1059.5605 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	308.1355	0.5190	159.9223 (268)
Energy saving/generation technologies			
PV Unit	-431.8098	0.5190	-224.1093 (269)
Total kg/year			995.3735 (272)
CO2 emissions per m2			14.5700 (273)
EI value			88.2277
EI rating			88 (274)
EI band			B

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

Calculation of stars for heating and DHW

Main heating 1 energy efficiency	$13.19 \times (1 + 0.29 \times 0.00) / 1.0000 = 13.190$, stars = 1
Main heating 2 energy efficiency	(does water heating only)
Main heating 1 environmental impact	$0.519 \times (1 + 0.29 \times 0.00) / 1.0000 = 0.5190$, stars = 2
Main heating 2 environmental impact	(does water heating only)
Water heating energy efficiency	$13.19 / 3.4941 = 3.775$, stars = 5
Water heating environmental impact	$0.519 / 3.4941 = 0.1485$, stars = 5

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	68.3000	2.4000	163.9200
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.3000		
Dwelling volume			

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour				
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000 (6a)				
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000 (6b)				
Number of intermittent fans							2 * 10 =	20.0000 (7a)				
Number of passive vents							0 * 10 =	0.0000 (7b)				
Number of flueless gas fires							0 * 40 =	0.0000 (7c)				
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						Air changes per hour					
Pressure test							20.0000 / (5) =	0.1220 (8)				
Measured/design AP50							Yes	4.0000				
Infiltration rate								0.3220 (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) =	0.2737 (21)				
Wind speed	Jan 4.2000	Feb 4.0000	Mar 4.0000	Apr 3.7000	May 3.7000	Jun 3.3000	Jul 3.4000	Aug 3.2000	Sep 3.3000	Oct 3.5000	Nov 3.5000	Dec 3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infiltr rate	0.2874	0.2737	0.2737	0.2532	0.2532	0.2258	0.2327	0.2190	0.2258	0.2395	0.2395	0.2600 (22b)
Effective ac	0.5413	0.5375	0.5375	0.5321	0.5321	0.5255	0.5271	0.5240	0.5255	0.5287	0.5287	0.5338 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.9500	1.0000	1.9500		(26)					
Window (Uw = 1.20)			13.0500	1.1450	14.9427		(27)					
Heat Loss Floor 1			68.3000	0.1200	8.1960		(28a)					
External Wall 1	44.1600	15.0000	29.1600	0.1800	5.2488		(29a)					
shelterd wall	11.5200		11.5200	0.1671	1.9246		(29a)					
External Roof 1	12.3000		12.3000	0.0900	1.1070		(30)					
Total net area of external elements Aum(A, m2)			136.2800				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.3692		(33)					
Party Wall 1			31.9200	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							3.8416 (36)					
Total fabric heat loss						(33) + (36) =	37.2108 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 29.2807	Feb 29.0731	Mar 29.0731	Apr 28.7805	May 28.7805	Jun 28.4259	Jul 28.5108	Aug 28.3436	Sep 28.4259	Oct 28.5982	Nov 28.5982	Dec 28.8755 (38)
Heat transfer coeff	66.4916	66.2839	66.2839	65.9913	65.9913	65.6367	65.7216	65.5544	65.6367	65.8090	65.8090	66.0863 (39)
Average = Sum(39)m / 12 =												65.9413 (39)
HLP	Jan 0.9735	Feb 0.9705	Mar 0.9705	Apr 0.9662	May 0.9662	Jun 0.9610	Jul 0.9622	Aug 0.9598	Sep 0.9610	Oct 0.9635	Nov 0.9635	Dec 0.9676 (40)
HLP (average)												0.9655 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2042 (42)
Average daily hot water use (litres/day)												86.5487 (43)
Daily hot water use	Jan 95.2036	Feb 91.7416	Mar 88.2797	Apr 84.8177	May 81.3558	Jun 77.8938	Jul 77.8938	Aug 81.3558	Sep 84.8177	Oct 88.2797	Nov 91.7416	Dec 95.2036 (44)
Energy conte	141.1841	123.4805	127.4208	111.0886	106.5921	91.9809	85.2338	97.8071	98.9752	115.3461	125.9092	136.7293 (45)
Energy content (annual)												Total = Sum(45)m = 1361.7478 (45)
Distribution loss (46)m = 0.15 x (45)m	21.1776	18.5221	19.1131	16.6633	15.9888	13.7971	12.7851	14.6711	14.8463	17.3019	18.8864	20.5094 (46)
Water storage loss:												201.0000 (47)
Store volume												1.6100 (48)
a) If manufacturer declared loss factor is known (kWh/day):												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 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)
Fraction of main heating from main system 2													0.0000 (203)
Fraction of total heating from main system 1													1.0000 (204)
Fraction of total heating from main system 2													0.0000 (205)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1261.6278 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	301.7293	220.2724	140.4116	43.2562	6.4957	0.0000	0.0000	0.0000	0.0000	52.1960	181.5589	315.7077	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	301.7293	220.2724	140.4116	43.2562	6.4957	0.0000	0.0000	0.0000	0.0000	52.1960	181.5589	315.7077	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Water heating requirement	168.1355	147.8237	154.3722	137.1706	133.5435	118.0629	112.1852	124.7585	125.0572	142.2975	151.9912	163.6807	(64)
Efficiency of water heater (217)m	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	(216)
Fuel for water heating, kWh/month	48.1198	42.3067	44.1808	39.2578	38.2197	33.7892	32.1070	35.7055	35.7910	40.7251	43.4994	46.8449	(219)
Water heating fuel used	480.5469											480.5469	(219)
Annual totals kWh/year													
Space heating fuel - main system												1261.6278	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												308.1355	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.50 * 1140 * 1.00) =												-456.0399	(233)
Total delivered energy for all uses												1594.2762	(238)

10a. Fuel costs - using BEDF prices (554)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1261.6278	25.0500	316.0378 (240)
Space heating - main system 2	0.0000	25.0500	0.0000 (241)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	480.5469	25.0500	120.3770 (247)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Energy for lighting	308.1355	25.0500	77.1879 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit	-456.0399	25.0500	-114.2380 (252)
Total energy cost			399.3647 (255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1261.6278	0.5190	654.7848 (261)
Space heating - main system 2	0.0000	0.5190	0.0000 (262)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	480.5469	0.5190	249.4038 (264)
Space and water heating			904.1887 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	308.1355	0.5190	159.9223 (268)
Energy saving/generation technologies			
PV Unit	-456.0399	0.5190	-236.6847 (269)
Total kg/year			827.4263 (272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1261.6278	3.0700	3873.1974 (261)
Space heating - main system 2	0.0000	3.0700	0.0000 (262)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	480.5469	3.0700	1475.2789 (264)
Space and water heating			5348.4762 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	308.1355	3.0700	945.9759 (268)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

Energy saving/generation technologies			
PV unit	-456.0399	3.0700	-1400.0425 (269)
Primary energy kwh/year			4894.4096 (272)
Primary energy kwh/m2/year			71.6605 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 87
Current environmental impact rating: B 88

(For testing purposes):	
A	Not considered
B	Not considered
C	Not considered
D	Not considered
E Low energy lighting	Already installed
F	Not considered
G	Not considered
H	Not considered
I	Not considered
J	Not considered
K	Not considered
M	Not considered
N Solar water heating	Not applicable
O	Not considered
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U Solar photovoltaic panels	Not applicable
A2	Not considered
A3	Not considered
T2	Not considered
W	Not considered
X	Not considered
Y	Not considered
J2	Not considered
Q2	Not considered
Z1	Not considered
Z2	Not considered
Z3	Not considered
Z4	Not considered
Z5	Not considered
V2 Wind turbine	Not applicable
L2	Not considered
Q3	Not considered
O3	Not considered

Recommended measures: (none) SAP change Cost change CO2 change

Recommended measures (none)	Typical annual savings	Energy efficiency	Environmental impact
	Total Savings £0		0.00 kg/m²

Potential energy efficiency rating: B 87
Potential environmental impact rating: B 88

Fuel prices for cost data on this page from database revision number 554 TEST (31 Oct 2024)
Recommendation texts revision number 4.9c (22 Feb 2014)

Typical heating and lighting costs of this home (per year, Thames Valley):			
	Current £514	Potential £514	Saving £0
Electricity			
Space heating	£316	£316	£0
Water heating	£120	£120	£0
Lighting	£77	£77	£0
Generated (PV)	-£114	-£114	£0
Total cost of fuels	£400	£400	£0
Total cost of uses	£399	£399	£0
Delivered energy	23 kWh/m²	23 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.8 tonnes	0.8 tonnes	0.0 tonnes
CO2 emissions per m²	12 kg/m²	12 kg/m²	0 kg/m²
Primary energy	72 kWh/m²	72 kWh/m²	0 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	2455-06- Flat 5	Issued on Date	05/05/2025
Assessment Reference	005	Prop Type Ref	
Property			

SAP Rating	89 B	DER	18.15	TER	29.09
Environmental	90 B	% DER<TER	37.60		
CO ₂ Emissions (t/year)	0.59	DFEE	36.28	TFEE	50.60
General Requirements Compliance	Pass	% DFEE<TFEE	28.29		

Assessor Details	Mrs. Naomi Sadler, Sadler Energy & Environmental Services Ltd, Tel: 01962 718870, naomi.sadler@sadlerenergy.co.uk	Assessor ID	4611-0001
Client	RHB PARTNERSHIP LLP , RHB		

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	52.4000 (1b)	2.4000 (2b)	125.7600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4000		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 125.7600 (5)
Dwelling volume			

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				1 * 10 =	10.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				10.0000 / (5) =	0.0795 (8)
Pressure test				Yes	
Measured/design AP50				4.0000	
Infiltration rate				0.2795 (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) =	0.2376 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate	0.2495	0.2376	0.2376	0.2198	0.2198	0.1960	0.2020	0.1901	0.1960	0.2079	0.2079	0.2257 (22b)
Effective ac	0.5311	0.5282	0.5282	0.5241	0.5241	0.5192	0.5204	0.5181	0.5192	0.5216	0.5216	0.5255 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.9500	1.0000	1.9500		(26)
Window (Uw = 1.20)			9.6800	1.1450	11.0840		(27)
Heat Loss Floor 1			52.4000	0.1200	6.2880		(28a)
External Wall 1	18.0000	11.6300	6.3700	0.1800	1.1466		(29a)
shelterd wall	35.2800		35.2800	0.1671	5.8942		(29a)
Total net area of external elements Aum(A, m ²)			105.6800				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.3628		(33)
Party Wall 1			31.9200	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							2.6694 (36)
Total fabric heat loss						(33) + (36) =	29.0322 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 22.0418	Feb 21.9217	Mar 21.9217	Apr 21.7526	May 21.7526	Jun 21.5476	Jul 21.5967	Aug 21.5001	Sep 21.5476	Oct 21.6472	Nov 21.6472	Dec 21.8075 (38)
Heat transfer coeff	51.0740	50.9539	50.9539	50.7848	50.7848	50.5798	50.6289	50.5323	50.5798	50.6794	50.6794	50.8397 (39)
Average = Sum(39)m / 12 =												50.7559 (39)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF HEAT DEMAND 09 Jan 2014

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9747	0.9724	0.9724	0.9692	0.9692	0.9653	0.9662	0.9644	0.9653	0.9672	0.9672	0.9702 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kwh/year)

Assumed occupancy	1.7609 (42)
Average daily hot water use (litres/day)	76.0207 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	83.6227	80.5819	77.5411	74.5003	71.4594	68.4186	68.4186	71.4594	74.5003	77.5411	80.5819	83.6227 (44)
Energy content (annual)	124.0101	108.4600	111.9210	97.5755	93.6260	80.7921	74.8658	85.9096	86.9356	101.3151	110.5933	120.0972 (45)
Distribution loss (46)m = 0.15 x (45)m	18.6015	16.2690	16.7882	14.6363	14.0439	12.1188	11.2299	12.8864	13.0403	15.1973	16.5890	18.0146 (46)
Water storage loss:												
Store volume												201.0000 (47)
a) If manufacturer declared loss factor is known (kwh/day):												1.6100 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8694 (55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (57)
Primary 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 (59)
Total heat required for water heating calculated for each month	150.9615	132.8032	138.8724	123.6575	120.5774	106.8741	101.8172	112.8610	113.0176	128.2665	136.6753	147.0486 (62)
Solar input	0.0000	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	150.9615	132.8032	138.8724	123.6575	120.5774	106.8741	101.8172	112.8610	113.0176	128.2665	136.6753	147.0486 (64)
RHI water heating demand												1513.4322 (64)
Heat gains from water heating, kwh/month	41.2334	36.0630	37.2137	32.4438	31.1306	26.8634	24.8929	28.5649	28.9061	33.6873	36.7723	39.9323 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	105.6522	105.6522	105.6522	105.6522	105.6522	105.6522	105.6522	105.6522	105.6522	105.6522	105.6522	105.6522 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	34.7945	30.9041	25.1329	19.0272	14.2231	12.0077	12.9748	16.8651	22.6363	28.7420	33.5462	35.7615 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	229.0495	231.4263	225.4368	212.6859	196.5901	181.4623	171.3561	168.9792	174.9687	187.7197	203.8155	218.9432 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.3261	47.3261	47.3261	47.3261	47.3261	47.3261	47.3261	47.3261	47.3261	47.3261	47.3261	47.3261 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348 (71)
Water heating gains (Table 5)	55.4212	53.6651	50.0185	45.0609	41.8423	37.3102	33.4582	38.3937	40.1473	45.2786	51.0726	53.6725 (72)
Total internal gains	401.8086	398.5391	383.1317	359.3175	335.1989	313.3238	300.3325	306.7816	320.2959	344.2838	370.9777	390.9207 (73)

6. Solar gains

[Jan]					Area	Solar flux	g		FF			Gains
					m2	Table 6a	Specific data	Specific data		Access		W
						W/m2	or Table 6b	or Table 6c		factor		
										Table 6d		
West					9.6800	22.3313	0.6300	0.7000		0.7700		66.0635 (80)
Solar gains	66.0635	116.2483	188.7667	282.9071	337.0958	369.0130	347.6251	305.8277	237.7086	147.2013	84.3880	53.8003 (83)
Total gains	467.8721	514.7873	571.8984	642.2246	672.2947	682.3368	647.9576	612.6093	558.0045	491.4850	455.3657	444.7210 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, n11,m (see Table 9a)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	71.2474	71.4153	71.4153	71.6531	71.6531	71.9435	71.8738	72.0112	71.9435	71.8021	71.8021	71.5757
util living area	5.7498	5.7610	5.7610	5.7769	5.7769	5.7962	5.7916	5.8007	5.7962	5.7868	5.7868	5.7717
	0.9818	0.9678	0.9205	0.7916	0.5908	0.3699	0.2422	0.2639	0.5197	0.8390	0.9603	0.9854 (86)
MIT	20.3469	20.4694	20.6915	20.8975	20.9832	20.9991	20.9999	20.9999	20.9937	20.8813	20.5893	20.3142 (87)
Th 2	20.1045	20.1064	20.1064	20.1091	20.1091	20.1124	20.1116	20.1131	20.1124	20.1108	20.1108	20.1082 (88)
util rest of house	0.9763	0.9586	0.8994	0.7483	0.5301	0.3046	0.1728	0.1908	0.4430	0.7917	0.9472	0.9810 (89)
MIT 2	19.2651	19.4400	19.7455	20.0062	20.0964	20.1120	20.1116	20.1131	20.1089	19.9962	19.6153	19.2215 (90)
Living area fraction									fLA = Living area / (4) =			0.5172 (91)
MIT	19.8246	19.9724	20.2347	20.4672	20.5550	20.5708	20.5710	20.5717	20.5665	20.4540	20.1190	19.7866 (92)
Temperature adjustment												0.0000

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF HEAT DEMAND 09 Jan 2014

adjusted MIT 19.8246 19.9724 20.2347 20.4672 20.5550 20.5708 20.5710 20.5717 20.5665 20.4540 20.1190 19.7866 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9743	0.9570	0.9028	0.7665	0.5609	0.3384	0.2087	0.2286	0.4826	0.8112	0.9473	0.9791 (94)
Useful gains	455.8400	492.6758	516.2982	492.2418	377.0842	230.8996	135.2185	140.0418	269.2822	398.6919	431.3695	435.4049 (95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Heat loss rate W	752.0444	732.3283	653.9807	536.6525	383.6814	231.1881	135.2308	140.0625	271.4374	448.7135	614.1849	746.6633 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kwh	220.3761	161.0465	102.4358	31.9757	4.9083	0.0000	0.0000	0.0000	0.0000	37.2161	131.6271	231.5763 (98)
Space heating												921.1618 (98)
RHI space heating demand												921 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	52.4000 (1b)	x 2.4000 (2b)	= 125.7600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 125.7600 (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				1 * 10 =	10.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				10.0000 / (5) = 0.0795 (8)
Pressure test					Yes
Measured/design AP50					4.0000
Infiltration rate					0.2795 (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) =				0.2376 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infiltr rate	0.3029	0.2970	0.2910	0.2613	0.2554	0.2257	0.2257	0.2198	0.2376	0.2554	0.2673	0.2792 (22b)
Effective ac	0.5459	0.5441	0.5424	0.5342	0.5326	0.5255	0.5255	0.5241	0.5282	0.5326	0.5357	0.5390 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.9500	1.0000	1.9500		(26)					
Window (Uw = 1.20)			9.6800	1.1450	11.0840		(27)					
Heat Loss Floor 1			52.4000	0.1200	6.2880		(28a)					
External Wall 1	18.0000	11.6300	6.3700	0.1800	1.1466		(29a)					
shelterd wall	35.2800		35.2800	0.1671	5.8942		(29a)					
Total net area of external elements Aum(A, m2)			105.6800				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.3628		(33)					
Party Wall 1			31.9200	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							2.6694 (36)					
Total fabric heat loss						(33) + (36) =	29.0322 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 22.6545	Feb 22.5806	Mar 22.5081	Apr 22.1677	May 22.1040	Jun 21.8075	Jul 21.8075	Aug 21.7526	Sep 21.9217	Oct 22.1040	Nov 22.2329	Dec 22.3676 (38)
Heat transfer coeff	51.6867	51.6128	51.5403	51.1999	51.1362	50.8397	50.8397	50.7848	50.9539	51.1362	51.2651	51.3998 (39)
Average = Sum(39)m / 12 =												51.1996 (39)
HLP	Jan 0.9864	Feb 0.9850	Mar 0.9836	Apr 0.9771	May 0.9759	Jun 0.9702	Jul 0.9702	Aug 0.9692	Sep 0.9724	Oct 0.9759	Nov 0.9783	Dec 0.9809 (40)
HLP (average)												0.9771 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7609 (42)
Average daily hot water use (litres/day)												76.0207 (43)
Daily hot water use	Jan 83.6227	Feb 80.5819	Mar 77.5411	Apr 74.5003	May 71.4594	Jun 68.4186	Jul 68.4186	Aug 71.4594	Sep 74.5003	Oct 77.5411	Nov 80.5819	Dec 83.6227 (44)
Energy conte	124.0101	108.4600	111.9210	97.5755	93.6260	80.7921	74.8658	85.9096	86.9356	101.3151	110.5933	120.0972 (45)
Energy content (annual)										Total = Sum(45)m =		1196.1012 (45)
Distribution loss (46)m = 0.15 x (45)m	18.6015	16.2690	16.7882	14.6363	14.0439	12.1188	11.2299	12.8864	13.0403	15.1973	16.5890	18.0146 (46)
Water storage loss:												201.0000 (47)
Store volume												1.6100 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

Enter (49) or (54) in (55)												0.8694 (55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (57)
Primary 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 (59)
Total heat required for water heating calculated for each month	150.9615	132.8032	138.8724	123.6575	120.5774	106.8741	101.8172	112.8610	113.0176	128.2665	136.6753	147.0486 (62)
Solar input	0.0000	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	150.9615	132.8032	138.8724	123.6575	120.5774	106.8741	101.8172	112.8610	113.0176	128.2665	136.6753	147.0486 (64)
Heat gains from water heating, kWh/month	41.2334	36.0630	37.2137	32.4438	31.1306	26.8634	24.8929	28.5649	28.9061	33.6873	36.7723	39.9323 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	105.6522	105.6522	105.6522	105.6522	105.6522	105.6522	105.6522	105.6522	105.6522	105.6522	105.6522	105.6522 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	34.7945	30.9041	25.1329	19.0272	14.2231	12.0077	12.9748	16.8651	22.6363	28.7420	33.5462	35.7615 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	229.0495	231.4263	225.4368	212.6859	196.5901	181.4623	171.3561	168.9792	174.9687	187.7197	203.8155	218.9432 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.3261	47.3261	47.3261	47.3261	47.3261	47.3261	47.3261	47.3261	47.3261	47.3261	47.3261	47.3261 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348 (71)
Water heating gains (Table 5)	55.4212	53.6651	50.0185	45.0609	41.8423	37.3102	33.4582	38.3937	40.1473	45.2786	51.0726	53.6725 (72)
Total internal gains	401.8086	398.5391	383.1317	359.3175	335.1989	313.3238	300.3325	306.7816	320.2959	344.2838	370.9777	390.9207 (73)

6. Solar gains

[Jan]												Area m2	Solar Flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W		
West												9.6800	19.6403		0.6300		0.7000		0.7700	58.1025 (80)
Solar gains	58.1025	113.6607	187.1830	272.9953	334.5660	342.4878	326.0624	280.0828	217.7016	134.8680	72.4469	47.7806 (83)								
Total gains	459.9111	512.1998	570.3147	632.3128	669.7649	655.8116	626.3949	586.8643	537.9975	479.1518	443.4247	438.7013 (84)								

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, n1,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	70.4028	70.5036	70.6028	71.0722	71.1607	71.5757	71.5757	71.6531	71.4153	71.1607	70.9818	70.7958
alpha	5.6935	5.7002	5.7069	5.7381	5.7440	5.7717	5.7717	5.7769	5.7610	5.7440	5.7321	5.7197
util living area	0.9868	0.9747	0.9395	0.8427	0.6781	0.4917	0.3565	0.3969	0.6328	0.8923	0.9740	0.9897 (86)
MIT	20.2439	20.3870	20.6090	20.8397	20.9604	20.9946	20.9993	20.9987	20.9794	20.8070	20.4807	20.2060 (87)
Th 2	20.0947	20.0959	20.0970	20.1025	20.1035	20.1082	20.1082	20.1091	20.1064	20.1035	20.1014	20.0993 (88)
util rest of house	0.9830	0.9676	0.9233	0.8071	0.6227	0.4252	0.2846	0.3207	0.5591	0.8577	0.9654	0.9866 (89)
MIT 2	19.1090	19.3145	19.6253	19.9311	20.0691	20.1050	20.1080	20.1086	20.0922	19.9001	19.4553	19.0581 (90)
Living area fraction	19.6959	19.8692	20.1341	20.4010	20.5300	20.5651	20.5689	20.5690	20.5510	20.3691	19.9856	19.6518 (92)
Temperature adjustment	19.6959	19.8692	20.1341	20.4010	20.5300	20.5651	20.5689	20.5690	20.5510	20.3691	19.9856	19.6518 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	451.1298	494.4941	526.9847	518.2723	435.1048	301.3528	201.5821	211.3447	320.9448	416.3259	427.4976	431.9896 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	795.7662	772.6005	702.7049	588.8492	451.5353	303.2641	201.7802	211.7196	328.7053	499.5558	660.5824	794.2189 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	256.4095	186.8875	130.7359	50.8153	12.2243	0.0000	0.0000	0.0000	0.0000	61.9231	167.8210	269.4985 (98)
Space heating per m ²												21.6854 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 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)
Fraction of main heating from main system 2													0.0000 (203)
Fraction of total heating from main system 1													1.0000 (204)
Fraction of total heating from main system 2													0.0000 (205)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1136.3152 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	256.4095	186.8875	130.7359	50.8153	12.2243	0.0000	0.0000	0.0000	0.0000	61.9231	167.8210	269.4985	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	256.4095	186.8875	130.7359	50.8153	12.2243	0.0000	0.0000	0.0000	0.0000	61.9231	167.8210	269.4985	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Water heating requirement	150.9615	132.8032	138.8724	123.6575	120.5774	106.8741	101.8172	112.8610	113.0176	128.2665	136.6753	147.0486	(64)
Efficiency of water heater (217)m	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	(216)
Fuel for water heating, kWh/month	43.2047	38.0079	39.7448	35.3904	34.5089	30.5870	29.1397	32.3004	32.3453	36.7094	39.1160	42.0848	(219)
Water heating fuel used												433.1393	(219)
Annual totals kWh/year													
Space heating fuel - main system												1136.3152	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												245.7925	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.50 * 1000 * 1.00) =										-431.8098		-431.8098	(233)
Total delivered energy for all uses												1383.4372	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1136.3152	13.1900	149.8800 (240)
Space heating - main system 2	0.0000	13.1900	0.0000 (241)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	433.1393	13.1900	57.1311 (247)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Energy for lighting	245.7925	13.1900	32.4200 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit	-431.8098	13.1900	-56.9557 (252)
Total energy cost			182.4754 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7869 (257)
SAP value		89.0234
SAP rating (Section 12)		89 (258)
SAP band		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1136.3152	0.5190	589.7476 (261)
Space heating - main system 2	0.0000	0.5190	0.0000 (262)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	433.1393	0.5190	224.7993 (264)
Space and water heating			814.5469 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	245.7925	0.5190	127.5663 (268)
Energy saving/generation technologies			
PV Unit	-431.8098	0.5190	-224.1093 (269)
Total kg/year			718.0039 (272)
CO2 emissions per m2			13.7000 (273)
EI value			90.1219
EI rating			90 (274)
EI band			B

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

Calculation of stars for heating and DHW

Main heating 1 energy efficiency	$13.19 \times (1 + 0.29 \times 0.00) / 1.0000 = 13.190$, stars = 1
Main heating 2 energy efficiency	(does water heating only)
Main heating 1 environmental impact	$0.519 \times (1 + 0.29 \times 0.00) / 1.0000 = 0.5190$, stars = 2
Main heating 2 environmental impact	(does water heating only)
Water heating energy efficiency	$13.19 / 3.4941 = 3.775$, stars = 5
Water heating environmental impact	$0.519 / 3.4941 = 0.1485$, stars = 5

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	52.4000 (1b)	x 2.4000 (2b)	= 125.7600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4000		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 125.7600 (5)
Dwelling volume			

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				1 * 10 =	10.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				10.0000 / (5) =	0.0795 (8)
Pressure test				Yes	
Measured/design AP50				4.0000	
Infiltration rate				0.2795 (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) =	0.2376 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infiltr rate	0.2495	0.2376	0.2376	0.2198	0.2198	0.1960	0.2020	0.1901	0.1960	0.2079	0.2079	0.2257 (22b)
Effective ac	0.5311	0.5282	0.5282	0.5241	0.5241	0.5192	0.5204	0.5181	0.5192	0.5216	0.5216	0.5255 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.9500	1.0000	1.9500		(26)					
Window (Uw = 1.20)			9.6800	1.1450	11.0840		(27)					
Heat Loss Floor 1			52.4000	0.1200	6.2880		(28a)					
External Wall 1	18.0000	11.6300	6.3700	0.1800	1.1466		(29a)					
shelterd wall	35.2800		35.2800	0.1671	5.8942		(29a)					
Total net area of external elements Aum(A, m2)			105.6800				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.3628		(33)					
Party Wall 1			31.9200	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							2.6694 (36)					
Total fabric heat loss						(33) + (36) =	29.0322 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 22.0418	Feb 21.9217	Mar 21.9217	Apr 21.7526	May 21.7526	Jun 21.5476	Jul 21.5967	Aug 21.5001	Sep 21.5476	Oct 21.6472	Nov 21.6472	Dec 21.8075 (38)
Heat transfer coeff	51.0740	50.9539	50.9539	50.7848	50.7848	50.5798	50.6289	50.5323	50.5798	50.6794	50.6794	50.8397 (39)
Average = Sum(39)m / 12 =												50.7559 (39)
HLP	Jan 0.9747	Feb 0.9724	Mar 0.9724	Apr 0.9692	May 0.9692	Jun 0.9653	Jul 0.9662	Aug 0.9644	Sep 0.9653	Oct 0.9672	Nov 0.9672	Dec 0.9702 (40)
HLP (average)												0.9686 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7609 (42)
Average daily hot water use (litres/day)												76.0207 (43)
Daily hot water use	83.6227	80.5819	77.5411	74.5003	71.4594	68.4186	68.4186	71.4594	74.5003	77.5411	80.5819	83.6227 (44)
Energy conte	124.0101	108.4600	111.9210	97.5755	93.6260	80.7921	74.8658	85.9096	86.9356	101.3151	110.5933	120.0972 (45)
Energy content (annual)										Total = Sum(45)m =		1196.1012 (45)
Distribution loss (46)m = 0.15 x (45)m	18.6015	16.2690	16.7882	14.6363	14.0439	12.1188	11.2299	12.8864	13.0403	15.1973	16.5890	18.0146 (46)
Water storage loss:												
Store volume												201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100 (48)
Temperature factor from Table 2b												0.5400 (49)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

Enter (49) or (54) in (55)												0.8694 (55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (57)
Primary 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 (59)
Total heat required for water heating calculated for each month	150.9615	132.8032	138.8724	123.6575	120.5774	106.8741	101.8172	112.8610	113.0176	128.2665	136.6753	147.0486 (62)
Solar input	0.0000	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	150.9615	132.8032	138.8724	123.6575	120.5774	106.8741	101.8172	Solar input (sum of months) = Sum(63)m =				0.0000 (63)
Heat gains from water heating, kWh/month	41.2334	36.0630	37.2137	32.4438	31.1306	26.8634	24.8929	28.5649	28.9061	33.6873	36.7723	39.9323 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	105.6522	105.6522	105.6522	105.6522	105.6522	105.6522	105.6522	105.6522	105.6522	105.6522	105.6522	105.6522	105.6522 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	34.7945	30.9041	25.1329	19.0272	14.2231	12.0077	12.9748	16.8651	22.6363	28.7420	33.5462	35.7615	35.7615 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	229.0495	231.4263	225.4368	212.6859	196.5901	181.4623	171.3561	168.9792	174.9687	187.7197	203.8155	218.9432	218.9432 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.3261	47.3261	47.3261	47.3261	47.3261	47.3261	47.3261	47.3261	47.3261	47.3261	47.3261	47.3261	47.3261 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348 (71)
Water heating gains (Table 5)	55.4212	53.6651	50.0185	45.0609	41.8423	37.3102	33.4582	38.3937	40.1473	45.2786	51.0726	53.6725	53.6725 (72)
Total internal gains	401.8086	398.5391	383.1317	359.3175	335.1989	313.3238	300.3325	306.7816	320.2959	344.2838	370.9777	390.9207	390.9207 (73)

6. Solar gains

[Jan]	Area m2		Solar Flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W	
West	9.6800		22.3313		0.6300		0.7000		0.7700		66.0635 (80)	
Solar gains	66.0635	116.2483	188.7667	282.9071	337.0958	369.0130	347.6251	305.8277	237.7086	147.2013	84.3880	53.8003 (83)
Total gains	467.8721	514.7873	571.8984	642.2246	672.2947	682.3368	647.9576	612.6093	558.0045	491.4850	455.3657	444.7210 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, n1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	71.2474	71.4153	71.4153	71.6531	71.6531	71.9435	71.8738	72.0112	71.9435	71.8021	71.8021	71.5757	
alpha	5.7498	5.7610	5.7610	5.7769	5.7769	5.7962	5.7916	5.8007	5.7962	5.7868	5.7868	5.7717	
util living area	0.9818	0.9678	0.9205	0.7916	0.5908	0.3699	0.2422	0.2639	0.5197	0.8390	0.9603	0.9854 (86)	
MIT	20.3469	20.4694	20.6915	20.8975	20.9832	20.9991	20.9999	20.9999	20.9937	20.8813	20.5893	20.3142 (87)	
Th 2	20.1045	20.1064	20.1064	20.1091	20.1091	20.1124	20.1116	20.1131	20.1124	20.1108	20.1108	20.1082 (88)	
util rest of house	0.9763	0.9586	0.8994	0.7483	0.5301	0.3046	0.1728	0.1908	0.4430	0.7917	0.9472	0.9810 (89)	
MIT 2	19.2651	19.4400	19.7455	20.0062	20.0964	20.1120	20.1116	20.1131	20.1089	19.9962	19.6153	19.2215 (90)	
Living area fraction									fLA = Living area / (4) =				0.5172 (91)
MIT	19.8246	19.9724	20.2347	20.4672	20.5550	20.5708	20.5710	20.5717	20.5665	20.4540	20.1190	19.7866 (92)	
Temperature adjustment	0.0000												
adjusted MIT	19.8246	19.9724	20.2347	20.4672	20.5550	20.5708	20.5710	20.5717	20.5665	20.4540	20.1190	19.7866 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	455.8400	492.6758	516.2982	492.2418	377.0842	230.8996	135.2185	140.0418	269.2822	398.6919	431.3695	435.4049	435.4049 (95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000	5.1000 (96)
Heat loss rate W	752.0444	732.3283	653.9807	536.6525	383.6814	231.1881	135.2308	140.0625	271.4374	448.7135	614.1849	746.6633	746.6633 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	220.3761	161.0465	102.4358	31.9757	4.9083	0.0000	0.0000	0.0000	0.0000	37.2161	131.6271	231.5763	231.5763 (98)
Space heating													921.1618 (98)
Space heating per m ²										(98) / (4) =			17.5794 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 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)
Fraction of main heating from main system 2													0.0000 (203)
Fraction of total heating from main system 1													1.0000 (204)
Fraction of total heating from main system 2													0.0000 (205)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													921.1618 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	220.3761	161.0465	102.4358	31.9757	4.9083	0.0000	0.0000	0.0000	0.0000	37.2161	131.6271	231.5763	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	220.3761	161.0465	102.4358	31.9757	4.9083	0.0000	0.0000	0.0000	0.0000	37.2161	131.6271	231.5763	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Water heating requirement	150.9615	132.8032	138.8724	123.6575	120.5774	106.8741	101.8172	112.8610	113.0176	128.2665	136.6753	147.0486	(64)
Efficiency of water heater (217)m	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	(216)
Fuel for water heating, kWh/month	43.2047	38.0079	39.7448	35.3904	34.5089	30.5870	29.1397	32.3004	32.3453	36.7094	39.1160	42.0848	(219)
Water heating fuel used												433.1393	(219)
Annual totals kWh/year													
Space heating fuel - main system												921.1618	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												245.7925	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.50 * 1140 * 1.00) =										-456.0399		-456.0399	(233)
Total delivered energy for all uses												1144.0537	(238)

10a. Fuel costs - using BEDF prices (554)

	Fuel	Fuel price	Fuel cost	
	kwh/year	p/kwh	£/year	
Space heating - main system 1	921.1618	25.0500	230.7510	(240)
Space heating - main system 2	0.0000	25.0500	0.0000	(241)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	433.1393	25.0500	108.5014	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Energy for lighting	245.7925	25.0500	61.5710	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit	-456.0399	25.0500	-114.2380	(252)
Total energy cost			286.5855	(255)

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

	Energy	Emission factor	Emissions	
	kWh/year	kg CO2/kWh	kg CO2/year	
Space heating - main system 1	921.1618	0.5190	478.0830	(261)
Space heating - main system 2	0.0000	0.5190	0.0000	(262)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	433.1393	0.5190	224.7993	(264)
Space and water heating			702.8823	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	245.7925	0.5190	127.5663	(268)
Energy saving/generation technologies				
PV Unit	-456.0399	0.5190	-236.6847	(269)
Total kg/year			593.7639	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy	Primary energy factor	Primary energy
	kWh/year	kg CO2/kWh	kWh/year
Space heating - main system 1	921.1618	3.0700	2827.9667 (261)
Space heating - main system 2	0.0000	3.0700	0.0000 (262)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	433.1393	3.0700	1329.7378 (264)
Space and water heating			4157.7045 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	245.7925	3.0700	754.5829 (268)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

Energy saving/generation technologies			
PV Unit	-456.0399	3.0700	-1400.0425 (269)
Primary energy kwh/year			3512.2449 (272)
Primary energy kwh/m2/year			67.0276 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 89
Current environmental impact rating: B 90

(For testing purposes):

A	Not considered
B	Not considered
C	Not considered
D	Not considered
E Low energy lighting	Already installed
F	Not considered
G	Not considered
H	Not considered
I	Not considered
J	Not considered
K	Not considered
M	Not considered
N Solar water heating	Not applicable
O	Not considered
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U Solar photovoltaic panels	Not applicable
A2	Not considered
A3	Not considered
T2	Not considered
W	Not considered
X	Not considered
Y	Not considered
J2	Not considered
Q2	Not considered
Z1	Not considered
Z2	Not considered
Z3	Not considered
Z4	Not considered
Z5	Not considered
V2 Wind turbine	Not applicable
L2	Not considered
Q3	Not considered
O3	Not considered

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 89
Potential environmental impact rating: B 90

Fuel prices for cost data on this page from database revision number 554 TEST (31 Oct 2024)
Recommendation texts revision number 4.9c (22 Feb 2014)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current £401	Potential £401	Saving £0
Electricity			
Space heating	£231	£231	£0
Water heating	£109	£109	£0
Lighting	£62	£62	£0
Generated (PV)	-£114	-£114	£0
Total cost of fuels	£287	£287	£0
Total cost of uses	£288	£288	£0
Delivered energy	22 kWh/m²	22 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.6 tonnes	0.6 tonnes	0.0 tonnes
CO2 emissions per m²	11 kg/m²	11 kg/m²	0 kg/m²
Primary energy	67 kWh/m²	67 kWh/m²	0 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	2455-06-Flat 6	Issued on Date	05/05/2025
Assessment Reference	006	Prop Type Ref	
Property			

SAP Rating	91 B	DER	15.03	TER	26.68
Environmental	92 A	% DER<TER	43.66		
CO ₂ Emissions (t/year)	0.47	DFEE	30.63	TFEE	43.34
General Requirements Compliance	Pass	% DFEE<TFEE	29.31		

Assessor Details	Mrs. Naomi Sadler, Sadler Energy & Environmental Services Ltd, Tel: 01962 718870, naomi.sadler@sadlerenergy.co.uk	Assessor ID	4611-0001
Client	RHB PARTNERSHIP LLP , RHB		

Calculation of Heat Demand 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
Calculation of Heat Demand 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	53.3000 (1b)	2.4000 (2b)	127.9200 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.3000		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 127.9200 (5)
Dwelling volume			

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				1 * 10 =	10.0000 (7a)							
Number of passive vents				0 * 10 =	0.0000 (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				10.0000 / (5) =	0.0782 (8)							
Measured/design AP50				Yes	4.0000							
Infiltration rate					0.2782 (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) =		0.2364 (21)							
Wind speed	Jan 4.2000	Feb 4.0000	Mar 4.0000	Apr 3.7000	May 3.7000	Jun 3.3000	Jul 3.4000	Aug 3.2000	Sep 3.3000	Oct 3.5000	Nov 3.5000	Dec 3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infiltr rate	0.2483	0.2364	0.2364	0.2187	0.2187	0.1951	0.2010	0.1892	0.1951	0.2069	0.2069	0.2246 (22b)
Effective ac	0.5308	0.5280	0.5280	0.5239	0.5239	0.5190	0.5202	0.5179	0.5190	0.5214	0.5214	0.5252 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.9500	1.0000	1.9500		(26)
Window (Uw = 1.20)			11.2900	1.1450	12.9275		(27)
External Wall 1	37.4400	13.2400	24.2000	0.1800	4.3560		(29a)
shelterd wall	15.8400		15.8400	0.1671	2.6464		(29a)
Total net area of external elements Aum(A, m ²)			53.2800				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.8799		(33)
Party Wall 1			16.3200	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							2.3738 (36)
Total fabric heat loss						(33) + (36) =	24.2537 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	Jan 22.4078	Feb 22.2868	Mar 22.2868	Apr 22.1165	May 22.1165	Jun 21.9100	Jul 21.9594
Heat transfer coeff	46.6615	46.5405	46.5405	46.3702	46.3702	46.1636	46.2131
Average = Sum(39)m / 12 =						46.1157	46.1636
						46.2640	46.2640
						46.4255 (39)	46.3410 (39)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF HEAT DEMAND 09 Jan 2014

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8754	0.8732	0.8732	0.8700	0.8700	0.8661	0.8670	0.8652	0.8661	0.8680	0.8680	0.8710 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kwh/year)

Assumed occupancy												1.7874 (42)
Average daily hot water use (litres/day)												76.6508 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	84.3158	81.2498	78.1838	75.1177	72.0517	68.9857	68.9857	72.0517	75.1177	78.1838	81.2498	84.3158 (44)
Energy content (annual)	125.0380	109.3590	112.8487	98.3842	94.4020	81.4617	75.4863	86.6216	87.6562	102.1548	111.5099	121.0926 (45)
Distribution loss (46)m = 0.15 x (45)m	18.7557	16.4038	16.9273	14.7576	14.1603	12.2193	11.3229	12.9932	13.1484	15.3232	16.7265	18.1639 (46)
Water storage loss:												
Store volume												201.0000 (47)
a) If manufacturer declared loss factor is known (kwh/day):												1.6100 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8694 (55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (57)
Primary 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 (59)
Total heat required for water heating calculated for each month	151.9894	133.7022	139.8001	124.4662	121.3534	107.5437	102.4377	113.5730	113.7382	129.1062	137.5919	148.0440 (62)
Solar input	0.0000	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	151.9894	133.7022	139.8001	124.4662	121.3534	107.5437	102.4377	113.5730	113.7382	129.1062	137.5919	148.0440 (64)
RHI water heating demand												1523.3460 (64)
Heat gains from water heating, kWh/month	41.5751	36.3619	37.5222	32.7128	31.3887	27.0860	25.0992	28.8017	29.1457	33.9665	37.0771	40.2633 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	34.7981	30.9074	25.1356	19.0293	14.2246	12.0090	12.9761	16.8669	22.6387	28.7450	33.5497	35.7653 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.5291	234.9420	228.8615	215.9169	199.5766	184.2190	173.9592	171.5463	177.6268	190.5714	206.9117	222.2693 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960 (71)
Water heating gains (Table 5)	55.8805	54.1099	50.4330	45.4344	42.1891	37.6195	33.7355	38.7119	40.4801	45.6539	51.4959	54.1173 (72)
Total internal gains	406.4676	403.2191	387.6900	363.6403	339.2561	317.1073	303.9306	310.3849	324.0054	348.2301	375.2171	395.4117 (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				1.6100	11.9814		0.6300		0.7000		0.7700		5.8953 (74)	
West				9.6800	22.3313		0.6300		0.7000		0.7700		66.0635 (80)	
Solar gains	71.9588	126.4762	206.1114	311.7426	374.8853	412.2296	387.5712	338.3071	260.3734	160.2569	91.8577	58.6554	(83)	
Total gains	478.4264	529.6954	593.8013	675.3829	714.1353	729.3369	691.5019	648.6920	584.3788	508.4871	467.0749	454.0671	(84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, n11,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	79.3243	79.5305	79.5305	79.8227	79.8227	80.1797	80.0940	80.2631	80.1797	80.0059	80.0059	79.7276
alpha	6.2883	6.3020	6.3020	6.3215	6.3215	6.3453	6.3396	6.3509	6.3453	6.3337	6.3337	6.3152
util living area	0.9765	0.9564	0.8890	0.7244	0.5154	0.3163	0.2072	0.2275	0.4564	0.7879	0.9466	0.9816 (86)
MIT	20.4905	20.6101	20.8050	20.9527	20.9947	20.9998	21.0000	21.0000	20.9981	20.9363	20.7041	20.4571 (87)
Th 2	20.1884	20.1904	20.1904	20.1931	20.1931	20.1964	20.1956	20.1972	20.1964	20.1948	20.1948	20.1922 (88)
util rest of house	0.9700	0.9451	0.8641	0.6816	0.4650	0.2656	0.1534	0.1704	0.3940	0.7390	0.9306	0.9763 (89)
MIT 2	19.5365	19.7054	19.9671	20.1470	20.1891	20.1963	20.1956	20.1972	20.1954	20.1353	19.8424	19.4924 (90)
Living area fraction	20.1056	20.2452	20.4670	20.6277	20.6698	20.6757	20.6755	20.6761	20.6743	20.6132	20.3565	20.0680 (92)
Temperature adjustment												0.0000

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF HEAT DEMAND 09 Jan 2014

adjusted MIT 20.1056 20.2452 20.4670 20.6277 20.6698 20.6757 20.6755 20.6761 20.6743 20.6132 20.3565 20.0680 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9692	0.9459	0.8731	0.7051	0.4949	0.2959	0.1855	0.2045	0.4312	0.7653	0.9342	0.9753 (94)
Useful gains	463.6913	501.0531	518.4672	476.2195	353.4575	215.7800	128.2629	132.6311	252.0093	389.1255	436.3233	442.8565 (95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Heat loss rate W	700.1855	681.5933	608.1463	497.4464	355.6475	215.8471	128.2653	132.6355	252.7130	416.9877	571.6619	694.8950 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	175.9517	121.3230	66.7213	15.2833	1.6294	0.0000	0.0000	0.0000	0.0000	20.7295	97.4438	187.5167 (98)
Space heating												686.5986 (98)
RHI space heating demand												687 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	53.3000 (1b)	x 2.4000 (2b)	= 127.9200 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.3000		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 127.9200 (5)
Dwelling volume			

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				1 * 10 =	10.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				10.0000 / (5) =	0.0782 (8)
Pressure test				Yes	
Measured/design AP50				4.0000	
Infiltration rate				0.2782 (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) =	0.2364 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.3015	0.2956	0.2896	0.2601	0.2542	0.2246	0.2246	0.2187	0.2364	0.2542	0.2660	0.2778 (22b)
Effective ac	0.5454	0.5437	0.5419	0.5338	0.5323	0.5252	0.5252	0.5239	0.5280	0.5323	0.5354	0.5386 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.9500	1.0000	1.9500		(26)					
Window (Uw = 1.20)			11.2900	1.1450	12.9275		(27)					
External Wall 1	37.4400	13.2400	24.2000	0.1800	4.3560		(29a)					
shelterd wall	15.8400		15.8400	0.1671	2.6464		(29a)					
Total net area of external elements Aum(A, m2)			53.2800				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	21.8799			(33)					
Party Wall 1			16.3200	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								2.3738 (36)				
Total fabric heat loss								(33) + (36) = 24.2537 (37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	23.0251	22.9506	22.8776	22.5346	22.4705	22.1718	22.1718	22.1165	22.2868	22.4705	22.6003	22.7360 (38)
Heat transfer coeff	47.2788	47.2043	47.1313	46.7883	46.7242	46.4255	46.4255	46.3702	46.5405	46.7242	46.8540	46.9897 (39)
Average = Sum(39)m / 12 =												46.7880 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.8870	0.8856	0.8843	0.8778	0.8766	0.8710	0.8710	0.8700	0.8732	0.8766	0.8791	0.8816 (40)
HLP (average)												0.8778 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.7874 (42)
Average daily hot water use (litres/day)													76.6508 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	84.3158	81.2498	78.1838	75.1177	72.0517	68.9857	68.9857	72.0517	75.1177	78.1838	81.2498	84.3158 (44)	
Energy content (annual)	125.0380	109.3590	112.8487	98.3842	94.4020	81.4617	75.4863	86.6216	87.6562	102.1548	111.5099	121.0926 (45)	
Energy content (annual)	Total = Sum(45)m =											1206.0150 (45)	
Distribution loss (46)m = 0.15 x (45)m													
	18.7557	16.4038	16.9273	14.7576	14.1603	12.2193	11.3229	12.9932	13.1484	15.3232	16.7265	18.1639 (46)	
Water storage loss:													
Store volume													201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.6100 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.8694 (55)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (57)
Primary 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 (59)
Total heat required for water heating calculated for each month	151.9894	133.7022	139.8001	124.4662	121.3534	107.5437	102.4377	113.5730	113.7382	129.1062	137.5919	148.0440 (62)
Solar input	0.0000	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	151.9894	133.7022	139.8001	124.4662	121.3534	107.5437	102.4377	113.5730	113.7382	129.1062	137.5919	148.0440 (64)
Heat gains from water heating, kWh/month	41.5751	36.3619	37.5222	32.7128	31.3887	27.0860	25.0992	28.8017	29.1457	33.9665	37.0771	40.2633 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	34.7981	30.9074	25.1356	19.0293	14.2246	12.0090	12.9761	16.8669	22.6387	28.7450	33.5497	35.7653 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.5291	234.9420	228.8615	215.9169	199.5766	184.2190	173.9592	171.5463	177.6268	190.5714	206.9117	222.2693 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960 (71)
Water heating gains (Table 5)	55.8805	54.1099	50.4330	45.4344	42.1891	37.6195	33.7355	38.7119	40.4801	45.6539	51.4959	54.1173 (72)
Total internal gains	406.4676	403.2191	387.6900	363.6403	339.2501	317.1073	303.9306	310.3849	324.0054	348.2301	375.2171	395.4117 (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						1.6100	10.6334	0.6300	0.7000	0.7700		5.2320 (74)
West						9.6800	19.6403	0.6300	0.7000	0.7700		58.1025 (80)
Solar gains	63.3345	123.6594	204.1732	300.2859	371.3289	381.8436	362.8060	309.2341	238.1293	146.7701	78.9013	52.1423 (83)
Total gains	469.8021	526.8785	591.8632	663.9262	710.5789	698.9509	666.7366	619.6191	562.1347	495.0003	454.1184	447.5540 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, n1,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	78.2886	78.4121	78.5336	79.1092	79.2179	79.7276	79.7276	79.8227	79.5305	79.2179	78.9984	78.7703
alpha	6.2192	6.2275	6.2356	6.2739	6.2812	6.3152	6.3152	6.3215	6.3020	6.2812	6.2666	6.2514
util living area	0.9836	0.9663	0.9155	0.7854	0.6004	0.4240	0.3063	0.3440	0.5640	0.8546	0.9659	0.9873 (86)
MIT	20.3940	20.5356	20.7379	20.9171	20.9853	20.9986	20.9999	20.9997	20.9924	20.8833	20.6059	20.3561 (87)
Th 2	20.1785	20.1797	20.1809	20.1864	20.1874	20.1922	20.1922	20.1931	20.1904	20.1874	20.1853	20.1832 (88)
util rest of house	0.9790	0.9575	0.8958	0.7476	0.5517	0.3710	0.2501	0.2838	0.5009	0.8161	0.9554	0.9837 (89)
MIT 2	19.3904	19.5919	19.8701	20.1003	20.1750	20.1913	20.1921	20.1930	20.1852	20.0679	19.6988	19.3399 (90)
Living area fraction									fLA = Living area / (4) =			0.5966 (91)
MIT	19.9891	20.1549	20.3879	20.5876	20.6585	20.6730	20.6740	20.6743	20.6668	20.5544	20.2400	19.9462 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9891	20.1549	20.3879	20.5876	20.6585	20.6730	20.6740	20.6743	20.6668	20.5544	20.2400	19.9462 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9778	0.9572	0.9012	0.7668	0.5802	0.4026	0.2836	0.3197	0.5383	0.8344	0.9562	0.9825 (94)
Ext temp.	4.3000	4.9000	5.33.3773	509.0867	412.2501	281.3947	189.0918	198.0989	302.5899	413.0201	434.2469	439.7163 (95)
Heat loss rate W	741.7629	720.0986	654.5530	546.8448	418.5773	281.9397	189.1393	198.1990	305.6216	465.1106	615.6610	739.9097 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	210.1105	145.0057	90.1547	27.1858	4.7074	0.0000	0.0000	0.0000	0.0000	38.7553	130.6181	223.3439 (98)
Space heating												869.8815 (98)
Space heating per m2										(98) / (4) =		16.3205 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 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)
Fraction of main heating from main system 2													0.0000 (203)
Fraction of total heating from main system 1													1.0000 (204)
Fraction of total heating from main system 2													0.0000 (205)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													869.8815 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	210.1105	145.0057	90.1547	27.1858	4.7074	0.0000	0.0000	0.0000	0.0000	38.7553	130.6181	223.3439	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	210.1105	145.0057	90.1547	27.1858	4.7074	0.0000	0.0000	0.0000	0.0000	38.7553	130.6181	223.3439	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Water heating requirement	151.9894	133.7022	139.8001	124.4662	121.3534	107.5437	102.4377	113.5730	113.7382	129.1062	137.5919	148.0440	(64)
Efficiency of water heater (217)m	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	(216)
Fuel for water heating, kWh/month	43.4989	38.2651	40.0103	35.6218	34.7309	30.7787	29.3173	32.5042	32.5515	36.9498	39.3784	42.3697	(219)
Water heating fuel used												435.9766	(219)
Annual totals kWh/year													
Space heating fuel - main system												869.8815	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												245.8184	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.50 * 1000 * 1.00) =										-431.8098		-431.8098	(233)
Total delivered energy for all uses												1119.8667	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	869.8815	13.1900	114.7374 (240)
Space heating - main system 2	0.0000	13.1900	0.0000 (241)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	435.9766	13.1900	57.5053 (247)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Energy for lighting	245.8184	13.1900	32.4235 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit	-431.8098	13.1900	-56.9557 (252)
Total energy cost			147.7104 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.4200 (256)
Energy cost factor (ECF)	0.6311 (257)
SAP value	91.1960
SAP rating (Section 12)	91 (258)
SAP band	B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	869.8815	0.5190	451.4685 (261)
Space heating - main system 2	0.0000	0.5190	0.0000 (262)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	435.9766	0.5190	226.2719 (264)
Space and water heating			677.7403 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	245.8184	0.5190	127.5798 (268)
Energy saving/generation technologies			
PV Unit	-431.8098	0.5190	-224.1093 (269)
Total kg/year			581.2108 (272)
CO2 emissions per m2			10.9000 (273)
EI value			92.0771
EI rating			92 (274)
EI band			A

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

Calculation of stars for heating and DHW

Main heating 1 energy efficiency	$13.19 \times (1 + 0.29 \times 0.00) / 1.0000 = 13.190$, stars = 1
Main heating 2 energy efficiency	(does water heating only)
Main heating 1 environmental impact	$0.519 \times (1 + 0.29 \times 0.00) / 1.0000 = 0.5190$, stars = 2
Main heating 2 environmental impact	(does water heating only)
Water heating energy efficiency	$13.19 / 3.4941 = 3.775$, stars = 5
Water heating environmental impact	$0.519 / 3.4941 = 0.1485$, stars = 5

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	53.3000 (1b)	x 2.4000 (2b)	= 127.9200 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.3000		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 127.9200 (5)
Dwelling volume			

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				1 * 10 =	10.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				10.0000 / (5) =	0.0782 (8)
Pressure test				Yes	
Measured/design AP50				4.0000	
Infiltration rate				0.2782 (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) =	0.2364 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infiltr rate	0.2483	0.2364	0.2364	0.2187	0.2187	0.1951	0.2010	0.1892	0.1951	0.2069	0.2069	0.2246 (22b)
Effective ac	0.5308	0.5280	0.5280	0.5239	0.5239	0.5190	0.5202	0.5179	0.5190	0.5214	0.5214	0.5252 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.9500	1.0000	1.9500		(26)
Window (Uw = 1.20)			11.2900	1.1450	12.9275		(27)
External Wall 1	37.4400	13.2400	24.2000	0.1800	4.3560		(29a)
shelterd wall	15.8400		15.8400	0.1671	2.6464		(29a)
Total net area of external elements Aum(A, m ²)			53.2800				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	21.8799			(33)
Party Wall 1			16.3200	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							2.3738 (36)
Total fabric heat loss						(33) + (36) =	24.2537 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	22.4078	22.2868	22.2868	22.1165	22.1165	21.9100	21.9594	21.8620	21.9100	22.0103	22.0103	22.1718 (38)
Average = Sum(39)m / 12 =	46.6615	46.5405	46.5405	46.3702	46.3702	46.1636	46.2131	46.1157	46.1636	46.2640	46.2640	46.4255 (39)
HLP	0.8754	0.8732	0.8732	0.8700	0.8700	0.8661	0.8670	0.8652	0.8661	0.8680	0.8680	0.8710 (40)
HLP (average)												0.8694 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												
Average daily hot water use (litres/day)												1.7874 (42)
												76.6508 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	84.3158	81.2498	78.1838	75.1177	72.0517	68.9857	68.9857	72.0517	75.1177	78.1838	81.2498	84.3158 (44)
Energy conte	125.0380	109.3590	112.8487	98.3842	94.4020	81.4617	75.4863	86.6216	87.6562	102.1548	111.5099	121.0926 (45)
Energy content (annual)												Total = Sum(45)m = 1206.0150 (45)
Distribution loss (46)m = 0.15 x (45)m	18.7557	16.4038	16.9273	14.7576	14.1603	12.2193	11.3229	12.9932	13.1484	15.3232	16.7265	18.1639 (46)
Water storage loss:												
Store volume												201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8694 (55)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (57)
Primary 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 (59)
Total heat required for water heating calculated for each month	151.9894	133.7022	139.8001	124.4662	121.3534	107.5437	102.4377	113.5730	113.7382	129.1062	137.5919	148.0440 (62)
Solar input	0.0000	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	151.9894	133.7022	139.8001	124.4662	121.3534	107.5437	102.4377	113.5730	113.7382	129.1062	137.5919	148.0440 (64)
Heat gains from water heating, kWh/month	41.5751	36.3619	37.5222	32.7128	31.3887	27.0860	25.0992	28.8017	29.1457	33.9665	37.0771	40.2633 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	34.7981	30.9074	25.1356	19.0293	14.2246	12.0090	12.9761	16.8669	22.6387	28.7450	33.5497	35.7653 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.5291	234.9420	228.8615	215.9169	199.5766	184.2190	173.9592	171.5463	177.6268	190.5714	206.9117	222.2693 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960 (71)
Water heating gains (Table 5)	55.8885	54.1099	50.4330	45.4344	42.1891	37.6195	33.7355	38.7119	40.4801	45.6539	51.4959	54.1173 (72)
Total internal gains	406.4676	403.2191	387.6900	363.6403	339.2501	317.1073	303.9306	310.3849	324.0054	348.2301	375.2171	395.4117 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		Specific data or Table 6b		Specific data or Table 6c		Access factor Table 6d		Gains W	
North				1.6100	11.9814		0.6300		0.7000		0.7700		5.8953 (74)	
West				9.6800	22.3313		0.6300		0.7000		0.7700		66.0635 (80)	
Solar gains	71.9588	126.4762	206.1114	311.7426	374.8853	412.2296	387.5712	338.3071	260.3734	160.2569	91.8577	58.6554	(83)	
Total gains	478.4264	529.6954	593.8013	675.3829	714.1353	729.3369	691.5019	648.6920	584.3788	508.4871	467.0749	454.0671	(84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, n1,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	79.3243	79.5305	79.5305	79.8227	79.8227	80.1797	80.0940	80.2631	80.1797	80.0059	80.0059	79.7276
alpha	6.2883	6.3020	6.3020	6.3215	6.3215	6.3453	6.3396	6.3509	6.3453	6.3337	6.3337	6.3152
util living area	0.9765	0.9564	0.8890	0.7244	0.5154	0.3163	0.2072	0.2275	0.4564	0.7879	0.9466	0.9816 (86)
MIT	20.4905	20.6101	20.8050	20.9527	20.9947	20.9998	21.0000	21.0000	20.9981	20.9363	20.7041	20.4571 (87)
Th 2	20.1884	20.1904	20.1904	20.1931	20.1931	20.1964	20.1956	20.1972	20.1964	20.1948	20.1948	20.1922 (88)
util rest of house	0.9700	0.9451	0.8641	0.6816	0.4650	0.2656	0.1534	0.1704	0.3940	0.7390	0.9306	0.9763 (89)
MIT 2	19.5365	19.7054	19.9671	20.1470	20.1891	20.1963	20.1956	20.1972	20.1954	20.1353	19.8424	19.4924 (90)
Living area fraction	20.1056	20.2452	20.4670	20.6277	20.6698	20.6757	20.6755	20.6761	20.6743	20.6132	20.3565	20.0680 (92)
Temperature adjustment	20.1056	20.2452	20.4670	20.6277	20.6698	20.6757	20.6755	20.6761	20.6743	20.6132	20.3565	20.0680 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9692	0.9459	0.8731	0.7051	0.4949	0.2959	0.1855	0.2045	0.4312	0.7653	0.9342	0.9753 (94)
Ext temp.	463.6913	501.0531	518.4672	476.2195	353.4575	215.7800	128.2629	132.6311	252.0093	389.1255	436.3233	442.8565 (95)
Heat loss rate w	5.1000	5.6000	7.4000	9.0000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Month fracti	700.1855	681.5933	608.1463	497.4464	355.6475	215.8471	128.2653	132.6355	252.7130	416.9877	571.6619	694.8950 (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	175.9517	121.3230	66.7213	15.2833	1.6294	0.0000	0.0000	0.0000	0.0000	20.7295	97.4438	187.5167 (98)
										(98) / (4) =		12.8818 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 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)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	686.5986	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	175.9517	121.3230	66.7213	15.2833	1.6294	0.0000	0.0000	0.0000	0.0000	20.7295	97.4438	187.5167	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	175.9517	121.3230	66.7213	15.2833	1.6294	0.0000	0.0000	0.0000	0.0000	20.7295	97.4438	187.5167	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Water heating requirement	151.9894	133.7022	139.8001	124.4662	121.3534	107.5437	102.4377	113.5730	113.7382	129.1062	137.5919	148.0440	(64)
Efficiency of water heater (217)m	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	(216)
Fuel for water heating, kWh/month	43.4989	38.2651	40.0103	35.6218	34.7309	30.7787	29.3173	32.5042	32.5515	36.9498	39.3784	42.3697	(219)
Water heating fuel used													(219)
Annual totals kWh/year													
Space heating fuel - main system													686.5986 (211)
Space heating fuel - secondary													0.0000 (215)

Electricity for pumps and fans:		
Total electricity for the above, kWh/year		0.0000 (231)
Electricity for lighting (calculated in Appendix L)		245.8184 (232)

Energy saving/generation technologies (Appendices M ,N and Q)		
PV Unit 0 (0.80 * 0.50 * 1140 * 1.00) =	-456.0399	-456.0399 (233)
Total delivered energy for all uses		912.3538 (238)

10a. Fuel costs - using BEDF prices (554)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	686.5986	25.0500	171.9930	(240)
Space heating - main system 2	0.0000	25.0500	0.0000	(241)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	435.9766	25.0500	109.2121	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Energy for lighting	245.8184	25.0500	61.5775	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit	-456.0399	25.0500	-114.2380	(252)
Total energy cost			228.5446	(255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	686.5986	0.5190	356.3447	(261)
Space heating - main system 2	0.0000	0.5190	0.0000	(262)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	435.9766	0.5190	226.2719	(264)
Space and water heating			582.6166	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	245.8184	0.5190	127.5798	(268)
Energy saving/generation technologies				
PV Unit	-456.0399	0.5190	-236.6847	(269)
Total kg/year			473.5116	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	686.5986	3.0700	2107.8578	(261)
Space heating - main system 2	0.0000	3.0700	0.0000	(262)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	435.9766	3.0700	1338.4483	(264)
Space and water heating			3446.3061	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	245.8184	3.0700	754.6626	(268)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

Energy saving/generation technologies			
PV Unit	-456.0399	3.0700	-1400.0425 (269)
Primary energy kwh/year			2800.9261 (272)
Primary energy kwh/m2/year			52.5502 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:	B 91
Current environmental impact rating:	A 92

(For testing purposes):

A	Not considered
B	Not considered
C	Not considered
D	Not considered
E Low energy lighting	Already installed
F	Not considered
G	Not considered
H	Not considered
I	Not considered
J	Not considered
K	Not considered
M	Not considered
N Solar water heating	Not applicable
O	Not considered
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U Solar photovoltaic panels	Not applicable
A2	Not considered
A3	Not considered
T2	Not considered
W	Not considered
X	Not considered
Y	Not considered
J2	Not considered
Q2	Not considered
Z1	Not considered
Z2	Not considered
Z3	Not considered
Z4	Not considered
Z5	Not considered
V2 Wind turbine	Not applicable
L2	Not considered
Q3	Not considered
O3	Not considered

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating:	B 91
Potential environmental impact rating:	A 92

Fuel prices for cost data on this page from database revision number 554 TEST (31 Oct 2024)
Recommendation texts revision number 4.9c (22 Feb 2014)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£343	£343	£0
Space heating	£172	£172	£0
Water heating	£109	£109	£0
Lighting	£62	£62	£0
Generated (PV)	-£114	-£114	£0
Total cost of fuels	£229	£229	£0
Total cost of uses	£229	£229	£0
Delivered energy	17 kWh/m²	17 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.5 tonnes	0.5 tonnes	0.0 tonnes
CO2 emissions per m²	9 kg/m²	9 kg/m²	0 kg/m²
Primary energy	53 kWh/m²	53 kWh/m²	0 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	2455-06 - Flat 3	Issued on Date	05/05/2025
Assessment Reference	007	Prop Type Ref	
Property			

SAP Rating	91 B	DER	15.12	TER	26.73
Environmental	92 A	% DER<TER	43.43		
CO ₂ Emissions (t/year)	0.48	DFEE	30.80	TFEE	43.49
General Requirements Compliance	Pass	% DFEE<TFEE	29.19		

Assessor Details	Mrs. Naomi Sadler, Sadler Energy & Environmental Services Ltd, Tel: 01962 718870, naomi.sadler@sadlerenergy.co.uk	Assessor ID	4611-0001
Client	RHB PARTNERSHIP LLP , RHB		

Calculation of Heat Demand 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
Calculation of Heat Demand 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	53.3000 (1b)	2.4000 (2b)	127.9200 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.3000		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 127.9200 (5)
Dwelling volume			

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				1 * 10 =	10.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				10.0000 / (5) =	0.0782 (8)
Pressure test				Yes	
Measured/design AP50				4.0000	
Infiltration rate				0.2782 (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) =	0.2364 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infiltr rate												
Effective ac	0.2483	0.2364	0.2364	0.2187	0.2187	0.1951	0.2010	0.1892	0.1951	0.2069	0.2069	0.2246 (22b)
	0.5308	0.5280	0.5280	0.5239	0.5239	0.5190	0.5202	0.5179	0.5190	0.5214	0.5214	0.5252 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.9500	1.0000	1.9500		(26)					
Window (Uw = 1.20)			11.2900	1.1450	12.9275		(27)					
External Wall 1	40.1200	13.2400	26.8800	0.1800	4.8384		(29a)					
shelterd wall	13.8800		13.8800	0.1671	2.3189		(29a)					
Total net area of external elements Aum(A, m2)			54.0000				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		22.0348		(33)					
Party Wall 1			16.3200	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							2.3738 (36)					
Total fabric heat loss						(33) + (36) =	24.4086 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	22.4078	22.2868	22.2868	22.1165	22.1165	21.9100	21.9594	21.8620	21.9100	22.0103	22.0103	22.1718 (38)
Average = Sum(39)m / 12 =	46.8164	46.6955	46.6955	46.5251	46.5251	46.3186	46.3680	46.2707	46.3186	46.4189	46.4189	46.5804 (39)
												46.4960 (39)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF HEAT DEMAND 09 Jan 2014

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8784	0.8761	0.8761	0.8729	0.8729	0.8690	0.8699	0.8681	0.8690	0.8709	0.8709	0.8739 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kwh/year)

Assumed occupancy												1.7874 (42)
Average daily hot water use (litres/day)												76.6508 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	84.3158	81.2498	78.1838	75.1177	72.0517	68.9857	68.9857	72.0517	75.1177	78.1838	81.2498	84.3158 (44)
Energy content (annual)	125.0380	109.3590	112.8487	98.3842	94.4020	81.4617	75.4863	86.6216	87.6562	102.1548	111.5099	121.0926 (45)
Distribution loss (46)m = 0.15 x (45)m	18.7557	16.4038	16.9273	14.7576	14.1603	12.2193	11.3229	12.9932	13.1484	15.3232	16.7265	18.1639 (46)
Water storage loss:												
Store volume												201.0000 (47)
a) If manufacturer declared loss factor is known (kwh/day):												1.6100 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8694 (55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (57)
Primary 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 (59)
Total heat required for water heating calculated for each month	151.9894	133.7022	139.8001	124.4662	121.3534	107.5437	102.4377	113.5730	113.7382	129.1062	137.5919	148.0440 (62)
Solar input	0.0000	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	151.9894	133.7022	139.8001	124.4662	121.3534	107.5437	102.4377	113.5730	113.7382	129.1062	137.5919	148.0440 (64)
RHI water heating demand												1523.3460 (64)
Heat gains from water heating, kwh/month	41.5751	36.3619	37.5222	32.7128	31.3887	27.0860	25.0992	28.8017	29.1457	33.9665	37.0771	40.2633 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	34.7981	30.9074	25.1356	19.0293	14.2246	12.0090	12.9761	16.8669	22.6387	28.7450	33.5497	35.7653 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.5291	234.9420	228.8615	215.9169	199.5766	184.2190	173.9592	171.5463	177.6268	190.5714	206.9117	222.2693 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960 (71)
Water heating gains (Table 5)	55.8805	54.1099	50.4330	45.4344	42.1891	37.6195	33.7355	38.7119	40.4801	45.6539	51.4959	54.1173 (72)
Total internal gains	406.4676	403.2191	387.6900	363.6403	339.2501	317.1073	303.9306	310.3849	324.0054	348.2301	375.2171	395.4117 (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			1.6100			11.9814			0.6300			0.7000			0.7700			5.8953 (74)
East			9.6800			22.3313			0.6300			0.7000			0.7700			66.0635 (76)
Solar gains	71.9588	126.4762	206.1114	311.7426	374.8853	412.2296	387.5712	338.3071	260.3734	160.2569	91.8577	58.6554	(83)					
Total gains	478.4264	529.6954	593.8013	675.3829	714.1353	729.3369	691.5019	648.6920	584.3788	508.4871	467.0749	454.0671	(84)					

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nll,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	79.9618	79.2666	79.2666	79.5568	79.5568	79.9115	79.8264	79.9943	79.9115	79.7388	79.7388	79.4623
alpha	6.2708	6.2844	6.2844	6.3038	6.3038	6.3274	6.3218	6.3330	6.3274	6.3159	6.3159	6.2975
util living area	0.9767	0.9568	0.8899	0.7261	0.5171	0.3174	0.2079	0.2282	0.4579	0.7893	0.9471	0.9817 (86)
MIT	20.4863	20.6063	20.8023	20.9516	20.9945	20.9998	21.0000	21.0000	20.9980	20.9351	20.7009	20.4529 (87)
Th 2	20.1859	20.1879	20.1879	20.1906	20.1906	20.1939	20.1931	20.1947	20.1939	20.1923	20.1923	20.1897 (88)
util rest of house	0.9702	0.9455	0.8651	0.6832	0.4664	0.2663	0.1538	0.1708	0.3951	0.7405	0.9312	0.9764 (89)
MIT 2	19.5286	19.6980	19.9613	20.1435	20.1865	20.1938	20.1931	20.1947	20.1928	20.1316	19.8360	19.4845 (90)
Living area fraction	20.1000	20.2399	20.4630	20.6256	20.6686	20.6747	20.6745	20.6751	20.6732	20.6110	20.3521	20.0623 (92)
MIT												0.0000
Temperature adjustment												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF HEAT DEMAND 09 Jan 2014

adjusted MIT 20.1000 20.2399 20.4630 20.6256 20.6686 20.6747 20.6745 20.6751 20.6732 20.6110 20.3521 20.0623 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9694	0.9463	0.8740	0.7067	0.4964	0.2968	0.1860	0.2051	0.4326	0.7667	0.9346	0.9755 (94)
Useful gains	463.7857	501.2563	519.0066	477.2917	354.5193	216.4548	128.6463	133.0301	252.7828	389.8533	436.5475	442.9255 (95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Heat loss rate W	702.2469	683.6157	609.9842	499.0117	356.7820	216.5248	128.6488	133.0347	253.5122	418.2797	573.3686	696.9499 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	177.4152	122.5455	67.6874	15.6384	1.6835	0.0000	0.0000	0.0000	0.0000	21.1493	98.5112	188.9942 (98)
Space heating												693.6246 (98)
RHI space heating demand												694 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	53.3000 (1b)	x 2.4000 (2b)	= 127.9200 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.3000		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 127.9200 (5)
Dwelling volume			

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				1 * 10 =	10.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				10.0000 / (5) =	0.0782 (8)
Pressure test					Yes
Measured/design AP50					4.0000
Infiltration rate					0.2782 (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) =	0.2364 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infiltr rate	0.3015	0.2956	0.2896	0.2601	0.2542	0.2246	0.2246	0.2187	0.2364	0.2542	0.2660	0.2778 (22b)
Effective ac	0.5454	0.5437	0.5419	0.5338	0.5323	0.5252	0.5252	0.5239	0.5280	0.5323	0.5354	0.5386 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.9500	1.0000	1.9500		(26)
Window (Uw = 1.20)			11.2900	1.1450	12.9275		(27)
External Wall 1	40.1200	13.2400	26.8800	0.1800	4.8384		(29a)
shelterd wall	13.8800		13.8800	0.1671	2.3189		(29a)
Total net area of external elements Aum(A, m ²)			54.0000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	22.0348			(33)
Party Wall 1			16.3200	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							2.3738 (36)
Total fabric heat loss						(33) + (36) =	24.4086 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	23.0251	22.9506	22.8776	22.5346	22.4705	22.1718	22.1718
Heat transfer coeff	47.4337	47.3592	47.2862	46.9433	46.8791	46.5804	46.5804
Average = Sum(39)m / 12 =							
HLP	0.8899	0.8885	0.8872	0.8807	0.8795	0.8739	0.8739
HLP (average)							
Days in month	31	28	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7874 (42)
Average daily hot water use (litres/day)												76.6508 (43)
Daily hot water use	84.3158	81.2498	78.1838	75.1177	72.0517	68.9857	68.9857	72.0517	75.1177	78.1838	81.2498	84.3158 (44)
Energy conte	125.0380	109.3590	112.8487	98.3842	94.4020	81.4617	75.4863	86.6216	87.6562	102.1548	111.5099	121.0926 (45)
Energy content (annual)												Total = Sum(45)m = 1206.0150 (45)
Distribution loss (46)m = 0.15 x (45)m	18.7557	16.4038	16.9273	14.7576	14.1603	12.2193	11.3229	12.9932	13.1484	15.3232	16.7265	18.1639 (46)
Water storage loss:												
Store volume												201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8694 (55)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (57)
Primary 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 (59)
Total heat required for water heating calculated for each month	151.9894	133.7022	139.8001	124.4662	121.3534	107.5437	102.4377	113.5730	113.7382	129.1062	137.5919	148.0440 (62)
Solar input	0.0000	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	151.9894	133.7022	139.8001	124.4662	121.3534	107.5437	102.4377	113.5730	113.7382	129.1062	137.5919	148.0440 (64)
Heat gains from water heating, kWh/month	41.5751	36.3619	37.5222	32.7128	31.3887	27.0860	25.0992	28.8017	29.1457	33.9665	37.0771	40.2633 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	34.7981	30.9074	25.1356	19.0293	14.2246	12.0090	12.9761	16.8669	22.6387	28.7450	33.5497	35.7653 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.5291	234.9420	228.8615	215.9169	199.5766	184.2190	173.9592	171.5463	177.6268	190.5714	206.9117	222.2693 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960 (71)
Water heating gains (Table 5)	55.8805	54.1099	50.4330	45.4344	42.1891	37.6195	33.7355	38.7119	40.4801	45.6539	51.4959	54.1173 (72)
Total internal gains	406.4676	403.2191	387.6900	363.6403	339.2501	317.1073	303.9306	310.3849	324.0054	348.2301	375.2171	395.4117 (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						1.6100	10.6334	0.6300	0.7000	0.7700		5.2320
East						9.6800	19.6403	0.6300	0.7000	0.7700		58.1025 (74)
Solar gains	63.3345	123.6594	204.1732	300.2859	371.3289	381.8436	362.8060	309.2341	238.1293	146.7701	78.9013	52.1423 (83)
Total gains	469.8021	526.8785	591.8632	663.9262	710.5789	698.9509	666.7366	619.6191	562.1347	495.0003	454.1184	447.5540 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, n1,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	78.0329	78.1556	78.2763	78.8481	78.9560	79.4623	79.4623	79.5568	79.2666	78.9560	78.7380	78.5114
alpha	6.2022	6.2104	6.2184	6.2565	6.2637	6.2975	6.2975	6.3038	6.2844	6.2637	6.2492	6.2341
util living area	0.9837	0.9666	0.9162	0.7868	0.6021	0.4254	0.3073	0.3451	0.5656	0.8557	0.9662	0.9874 (86)
MIT	20.3896	20.5315	20.7347	20.9155	20.9849	20.9985	20.9998	20.9997	20.9921	20.8814	20.6024	20.3517 (87)
Th 2	20.1761	20.1773	20.1784	20.1839	20.1849	20.1897	20.1897	20.1906	20.1879	20.1849	20.1829	20.1807 (88)
util rest of house	0.9791	0.9578	0.8966	0.7491	0.5532	0.3721	0.2508	0.2845	0.5022	0.8173	0.9558	0.9838 (89)
MIT 2	19.3822	19.5841	19.8637	20.0961	20.1722	20.1888	20.1897	20.1905	20.1826	20.0634	19.6918	19.3316 (90)
Living area fraction	19.9832	20.1494	20.3833	20.5850	20.6571	20.6719	20.6730	20.6733	20.6656	20.5515	20.2351	19.9403 (92)
MIT	19.9832	20.1494	20.3833	20.5850	20.6571	20.6719	20.6730	20.6733	20.6656	20.5515	20.2351	19.9403 (93)
Temperature adjustment												0.0000
adjusted MIT	19.9832	20.1494	20.3833	20.5850	20.6571	20.6719	20.6730	20.6733	20.6656	20.5515	20.2351	19.9403 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9779	0.9575	0.9019	0.7682	0.5818	0.4038	0.2845	0.3207	0.5398	0.8355	0.9565	0.9826 (94)
Ext temp.	459.4156	504.4659	533.7923	510.0234	413.3913	282.2664	189.6740	198.7098	303.4582	413.5725	434.3809	439.7583 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	10.6000	10.6000	7.1000	4.2000 (96)
Month fracti	743.9137	722.1977	656.4901	548.5305	419.9002	282.8320	189.7236	198.8142	306.5830	466.5156	617.4654	742.0684 (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	211.6666	146.3158	91.2872	27.7252	4.8427	0.0000	0.0000	0.0000	0.0000	39.3896	131.8208	224.9188 (98)
										(98) / (4) =		16.4722 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 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)
Fraction of main heating from main system 2													0.0000 (203)
Fraction of total heating from main system 1													1.0000 (204)
Fraction of total heating from main system 2													0.0000 (205)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													877.9666 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	211.6666	146.3158	91.2872	27.7252	4.8427	0.0000	0.0000	0.0000	0.0000	39.3896	131.8208	224.9188	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	211.6666	146.3158	91.2872	27.7252	4.8427	0.0000	0.0000	0.0000	0.0000	39.3896	131.8208	224.9188	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Water heating requirement	151.9894	133.7022	139.8001	124.4662	121.3534	107.5437	102.4377	113.5730	113.7382	129.1062	137.5919	148.0440	(64)
Efficiency of water heater (217)m	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	(216)
Fuel for water heating, kWh/month	43.4989	38.2651	40.0103	35.6218	34.7309	30.7787	29.3173	32.5042	32.5515	36.9498	39.3784	42.3697	(219)
Water heating fuel used													(219)
Annual totals kWh/year													
Space heating fuel - main system													877.9666 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year													0.0000 (231)
Electricity for lighting (calculated in Appendix L)													245.8184 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.50 * 1080 * 1.00) =										-431.8098			-431.8098 (233)
Total delivered energy for all uses													1127.9518 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	877.9666	13.1900	115.8038 (240)
Space heating - main system 2	0.0000	13.1900	0.0000 (241)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	435.9766	13.1900	57.5053 (247)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Energy for lighting	245.8184	13.1900	32.4235 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit	-431.8098	13.1900	-56.9557 (252)
Total energy cost			148.7768 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.4200 (256)
Energy cost factor (ECF)	0.6357 (257)
SAP value	91.1324
SAP rating (Section 12)	91 (258)
SAP band	B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	877.9666	0.5190	455.6647 (261)
Space heating - main system 2	0.0000	0.5190	0.0000 (262)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	435.9766	0.5190	226.2719 (264)
Space and water heating			681.9366 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	245.8184	0.5190	127.5798 (268)
Energy saving/generation technologies			
PV Unit	-431.8098	0.5190	-224.1093 (269)
Total kg/year			585.4070 (272)
CO2 emissions per m2			10.9800 (273)
EI value			92.0199
EI rating			92 (274)
EI band			A

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

Calculation of stars for heating and DHW

Main heating 1 energy efficiency	$13.19 \times (1 + 0.29 \times 0.00) / 1.0000 = 13.190$, stars = 1
Main heating 2 energy efficiency	(does water heating only)
Main heating 1 environmental impact	$0.519 \times (1 + 0.29 \times 0.00) / 1.0000 = 0.5190$, stars = 2
Main heating 2 environmental impact	(does water heating only)
Water heating energy efficiency	$13.19 / 3.4941 = 3.775$, stars = 5
Water heating environmental impact	$0.519 / 3.4941 = 0.1485$, stars = 5

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	53.3000 (1b)	x 2.4000 (2b)	= 127.9200 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.3000		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 127.9200 (5)
Dwelling volume			

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				1 * 10 =	10.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				10.0000 / (5) =	0.0782 (8)
Pressure test				Yes	
Measured/design AP50				4.0000	
Infiltration rate				0.2782 (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) =	0.2364 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infiltr rate	0.2483	0.2364	0.2364	0.2187	0.2187	0.1951	0.2010	0.1892	0.1951	0.2069	0.2069	0.2246 (22b)
Effective ac	0.5308	0.5280	0.5280	0.5239	0.5239	0.5190	0.5202	0.5179	0.5190	0.5214	0.5214	0.5252 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.9500	1.0000	1.9500		(26)					
Window (Uw = 1.20)			11.2900	1.1450	12.9275		(27)					
External Wall 1	40.1200	13.2400	26.8800	0.1800	4.8384		(29a)					
shelterd wall	13.8800		13.8800	0.1671	2.3189		(29a)					
Total net area of external elements Aum(A, m2)			54.0000				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		22.0348		(33)					
Party Wall 1			16.3200	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								2.3738 (36)				
Total fabric heat loss								(33) + (36) = 24.4086 (37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 22.4078	Feb 22.2868	Mar 22.2868	Apr 22.1165	May 22.1165	Jun 21.9100	Jul 21.9594	Aug 21.8620	Sep 21.9100	Oct 22.0103	Nov 22.0103	Dec 22.1718 (38)
Heat transfer coeff	46.8164	46.6955	46.6955	46.5251	46.5251	46.3186	46.3680	46.2707	46.3186	46.4189	46.4189	46.5804 (39)
Average = Sum(39)m / 12 =												46.4960 (39)
HLP	Jan 0.8784	Feb 0.8761	Mar 0.8761	Apr 0.8729	May 0.8729	Jun 0.8690	Jul 0.8699	Aug 0.8681	Sep 0.8690	Oct 0.8709	Nov 0.8709	Dec 0.8739 (40)
HLP (average)												0.8723 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7874 (42)
Average daily hot water use (litres/day)												76.6508 (43)
Daily hot water use	84.3158	81.2498	78.1838	75.1177	72.0517	68.9857	68.9857	72.0517	75.1177	78.1838	81.2498	84.3158 (44)
Energy conte	125.0380	109.3590	112.8487	98.3842	94.4020	81.4617	75.4863	86.6216	87.6562	102.1548	111.5099	121.0926 (45)
Energy content (annual)												1206.0150 (45)
Distribution loss (46)m = 0.15 x (45)m	18.7557	16.4038	16.9273	14.7576	14.1603	12.2193	11.3229	12.9932	13.1484	15.3232	16.7265	18.1639 (46)
Water storage loss:												
Store volume												201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8694 (55)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (57)
Primary 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 (59)
Total heat required for water heating calculated for each month	151.9894	133.7022	139.8001	124.4662	121.3534	107.5437	102.4377	113.5730	113.7382	129.1062	137.5919	148.0440 (62)
Solar input	0.0000	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	151.9894	133.7022	139.8001	124.4662	121.3534	107.5437	102.4377	113.5730	113.7382	129.1062	137.5919	148.0440 (64)
Heat gains from water heating, kWh/month	41.5751	36.3619	37.5222	32.7128	31.3887	27.0860	25.0992	28.8017	29.1457	33.9665	37.0771	40.2633 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440	107.2440 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	34.7981	30.9074	25.1356	19.0293	14.2246	12.0090	12.9761	16.8669	22.6387	28.7450	33.5497	35.7653 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.5291	234.9420	228.8615	215.9169	199.5766	184.2190	173.9592	171.5463	177.6268	190.5714	206.9117	222.2693 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118	47.5118 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960	-71.4960 (71)
Water heating gains (Table 5)	55.8885	54.1099	50.4330	45.4344	42.1891	37.6195	33.7355	38.7119	40.4801	45.6539	51.4959	54.1173 (72)
Total internal gains	406.4676	403.2191	387.6900	363.6403	339.2501	317.1073	303.9306	310.3849	324.0054	348.2301	375.2171	395.4117 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		Specific data or Table 6b		Specific data or Table 6c		Access factor Table 6d		Gains W	
North				1.6100	11.9814		0.6300		0.7000		0.7700		5.8953 (74)	
East				9.6800	22.3313		0.6300		0.7000		0.7700		66.0635 (76)	
Solar gains	71.9588	126.4762	206.1114	311.7426	374.8853	412.2296	387.5712	338.3071	260.3734	160.2569	91.8577	58.6554	(83)	
Total gains	478.4264	529.6954	593.8013	675.3829	714.1353	729.3369	691.5019	648.6920	584.3788	508.4871	467.0749	454.0671	(84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, n1,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	79.0618	79.2666	79.2666	79.5568	79.5568	79.9115	79.8264	79.9943	79.9115	79.7388	79.7388	79.4623
alpha	6.2708	6.2844	6.2844	6.3038	6.3038	6.3274	6.3218	6.3330	6.3274	6.3159	6.3159	6.2975
util living area	0.9767	0.9568	0.8899	0.7261	0.5171	0.3174	0.2079	0.2282	0.4579	0.7893	0.9471	0.9817 (86)
MIT	20.4863	20.6063	20.8023	20.9516	20.9945	20.9998	21.0000	21.0000	20.9980	20.9351	20.7009	20.4529 (87)
Th 2	20.1859	20.1879	20.1879	20.1906	20.1906	20.1939	20.1931	20.1947	20.1939	20.1923	20.1923	20.1897 (88)
util rest of house	0.9702	0.9455	0.8651	0.6832	0.4664	0.2663	0.1538	0.1708	0.3951	0.7405	0.9312	0.9764 (89)
MIT 2	19.5286	19.6980	19.9613	20.1435	20.1865	20.1938	20.1931	20.1947	20.1928	20.1316	19.8360	19.4845 (90)
Living area fraction									fLA = Living area / (4) =			0.5966 (91)
MIT	20.1000	20.2399	20.4630	20.6256	20.6686	20.6747	20.6745	20.6751	20.6732	20.6110	20.3521	20.0623 (92)
Temperature adjustment												0.0000
adjusted MIT	20.1000	20.2399	20.4630	20.6256	20.6686	20.6747	20.6745	20.6751	20.6732	20.6110	20.3521	20.0623 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9694	0.9463	0.8740	0.7067	0.4964	0.2968	0.1860	0.2051	0.4326	0.7667	0.9346	0.9755 (94)
Ext temp.	463.7857	501.2563	519.0066	477.2917	354.5193	216.4548	128.6463	133.6301	252.7828	389.8533	436.5475	442.9255 (95)
Heat loss rate W	5.1000	5.0000	7.4000	9.9000	13.0000	16.0000	17.9000	17.0000	15.2000	11.6000	8.0000	5.1000 (96)
Month fracti	702.2469	683.6157	609.9842	499.0117	356.7820	216.5248	128.6488	133.0347	253.5122	418.2797	573.3686	696.9499 (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	177.4152	122.5455	67.6874	15.6384	1.6835	0.0000	0.0000	0.0000	0.0000	21.1493	98.5112	188.9942 (98)
										(98) / (4) =		693.6246 (98)
												13.0136 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 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)
Fraction of main heating from main system 2													0.0000	(203)
Fraction of total heating from main system 1													1.0000	(204)
Fraction of total heating from main system 2													0.0000	(205)
Efficiency of main space heating system 1 (in %)													100.0000	(206)
Efficiency of main space heating system 2 (in %)													0.0000	(207)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													693.6246	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	177.4152	122.5455	67.6874	15.6384	1.6835	0.0000	0.0000	0.0000	0.0000	21.1493	98.5112	188.9942	(98)	
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)	
Space heating fuel (main heating system)	177.4152	122.5455	67.6874	15.6384	1.6835	0.0000	0.0000	0.0000	0.0000	21.1493	98.5112	188.9942	(211)	
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)	
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)	
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)	
Space heating fuel used, main system 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)	
Water heating requirement	151.9894	133.7022	139.8001	124.4662	121.3534	107.5437	102.4377	113.5730	113.7382	129.1062	137.5919	148.0440	(64)	
Efficiency of water heater (217)m	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	(216)	
Fuel for water heating, kWh/month	43.4989	38.2651	40.0103	35.6218	34.7309	30.7787	29.3173	32.5042	32.5515	36.9498	39.3784	42.3697	(219)	
Water heating fuel used												435.9766	(219)	
Annual totals kWh/year														
Space heating fuel - main system												693.6246	(211)	
Space heating fuel - secondary												0.0000	(215)	
Electricity for pumps and fans:														
Total electricity for the above, kWh/year												0.0000	(231)	
Electricity for lighting (calculated in Appendix L)												245.8184	(232)	
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 0.50 * 1140 * 1.00) =										-456.0399		-456.0399	(233)	
Total delivered energy for all uses												919.3798	(238)	

10a. Fuel costs - using BEDF prices (554)

	Fuel	Fuel price	Fuel cost
	kWh/year	p/kWh	£/year
Space heating - main system 1	693.6246	25.0500	173.7530 (240)
Space heating - main system 2	0.0000	25.0500	0.0000 (241)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	435.9766	25.0500	109.2121 (247)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Energy for lighting	245.8184	25.0500	61.5775 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit	-456.0399	25.0500	-114.2380 (252)
Total energy cost			230.3046 (255)

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

	Energy	Emission factor	Emissions
	kWh/year	kg CO2/kWh	kg CO2/year
Space heating - main system 1	693.6246	0.5190	359.9912 (261)
Space heating - main system 2	0.0000	0.5190	0.0000 (262)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	435.9766	0.5190	226.2719 (264)
Space and water heating			586.2631 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	245.8184	0.5190	127.5798 (268)
Energy saving/generation technologies			
PV Unit	-456.0399	0.5190	-236.6847 (269)
Total kg/year			477.1581 (272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy	Primary energy factor	Primary energy
	kWh/year	kg CO2/kWh	kWh/year
Space heating - main system 1	693.6246	3.0700	2129.4276 (261)
Space heating - main system 2	0.0000	3.0700	0.0000 (262)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	435.9766	3.0700	1338.4483 (264)
Space and water heating			3467.8759 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	245.8184	3.0700	754.6626 (268)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

Energy saving/generation technologies			
PV Unit	-456.0399	3.0700	-1400.0425 (269)
Primary energy kwh/year			2822.4959 (272)
Primary energy kwh/m2/year			52.9549 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 91
Current environmental impact rating: A 92

(For testing purposes):

A	Not considered
B	Not considered
C	Not considered
D	Not considered
E Low energy lighting	Already installed
F	Not considered
G	Not considered
H	Not considered
I	Not considered
J	Not considered
K	Not considered
M	Not considered
N Solar water heating	Not applicable
O	Not considered
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U Solar photovoltaic panels	Not applicable
A2	Not considered
A3	Not considered
T2	Not considered
W	Not considered
X	Not considered
Y	Not considered
J2	Not considered
Q2	Not considered
Z1	Not considered
Z2	Not considered
Z3	Not considered
Z4	Not considered
Z5	Not considered
V2 Wind turbine	Not applicable
L2	Not considered
Q3	Not considered
O3	Not considered

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 91
Potential environmental impact rating: A 92

Fuel prices for cost data on this page from database revision number 554 TEST (31 Oct 2024)
Recommendation texts revision number 4.9c (22 Feb 2014)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£345	£345	£0
Space heating	£174	£174	£0
Water heating	£109	£109	£0
Lighting	£62	£62	£0
Generated (PV)	-£114	-£114	£0
Total cost of fuels	£231	£231	£0
Total cost of uses	£231	£231	£0
Delivered energy	17 kWh/m²	17 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.5 tonnes	0.5 tonnes	0.0 tonnes
CO2 emissions per m²	9 kg/m²	9 kg/m²	0 kg/m²
Primary energy	53 kWh/m²	53 kWh/m²	0 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	2455-06- Flat 8	Issued on Date	05/05/2025
Assessment Reference	008	Prop Type Ref	
Property			

SAP Rating	89 B	DER	15.64	TER	23.57
Environmental	90 B	% DER<TER	33.65		
CO ₂ Emissions (t/year)	0.69	DFEE	30.58	TFEE	40.71
General Requirements Compliance	Pass	% DFEE<TFEE	24.87		

Assessor Details	Mrs. Naomi Sadler, Sadler Energy & Environmental Services Ltd, Tel: 01962 718870, naomi.sadler@sadlerenergy.co.uk	Assessor ID	4611-0001
Client	RHB PARTNERSHIP LLP , RHB		

Calculation of Heat Demand 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
Calculation of Heat Demand 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.4000 (1b)	2.4000 (2b)	173.7600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.4000		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 173.7600 (5)
Dwelling volume			

2. Ventilation rate

	main heating		secondary heating		other		total		m3 per hour			
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)			
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)			
Number of intermittent fans							2 * 10 =	20.0000	(7a)			
Number of passive vents							0 * 10 =	0.0000	(7b)			
Number of flueless gas fires							0 * 40 =	0.0000	(7c)			
									Air changes per hour			
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						20.0000 / (5) =	0.1151	(8)			
Pressure test							Yes	4.0000				
Measured/design AP50								0.3151	(18)			
Infiltration rate								2	(19)			
Number of sides sheltered												
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.8500	(20)			
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.2678	(21)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate	0.2812	0.2678	0.2678	0.2477	0.2477	0.2210	0.2277	0.2143	0.2210	0.2344	0.2344	0.2544 (22b)
Effective ac	0.5395	0.5359	0.5359	0.5307	0.5307	0.5244	0.5259	0.5230	0.5244	0.5275	0.5275	0.5324 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K					
Door			1.9500	1.0000	1.9500			(26)				
Window (Uw = 1.20)			13.7400	1.1450	15.7328			(27)				
External Wall 1	51.6000	15.6900	35.9100	0.1800	6.4638			(29a)				
shelterd wall	11.5200		11.5200	0.1671	1.9246			(29a)				
External Roof 1	19.9000		19.9000	0.0900	1.7910			(30)				
Total net area of external elements Aum(A, m ²)			83.0200					(31)				
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	27.8623			(33)				
Party Wall 1			24.2400	0.0000	0.0000			(32)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K								250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								3.6264 (36)				
Total fabric heat loss						(33) + (36) =		31.4886 (37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 30.9379	Feb 30.7271	Mar 30.7271	Apr 30.4302	May 30.4302	Jun 30.0702	Jul 30.1564	Aug 29.9867	Sep 30.0702	Oct 30.2451	Nov 30.2451	Dec 30.5266 (38)
Heat transfer coeff	62.4265	62.2157	62.2157	61.9188	61.9188	61.5589	61.6450	61.4753	61.5589	61.7337	61.7337	62.0152 (39)
Average = Sum(39)m / 12 =												61.8680 (39)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF HEAT DEMAND 09 Jan 2014

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8622	0.8593	0.8593	0.8552	0.8552	0.8503	0.8515	0.8491	0.8503	0.8527	0.8527	0.8566 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kwh/year)

Assumed occupancy	2.3030 (42)
Average daily hot water use (litres/day)	88.8951 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	97.7846	94.2288	90.6730	87.1172	83.5614	80.0056	80.0056	83.5614	87.1172	90.6730	94.2288	97.7846 (44)
Energy content	145.0118	126.8282	130.8754	114.1003	109.4820	94.4746	87.5446	100.4587	101.6585	118.4732	129.3228	140.4362 (45)
Energy content (annual)	Total = Sum(45)m =											1398.6665 (45)
Distribution loss (46)m = 0.15 x (45)m	21.7518	19.0242	19.6313	17.1151	16.4223	14.1712	13.1317	15.0688	15.2488	17.7710	19.3984	21.0654 (46)
Water storage loss:												201.0000 (47)
Store volume												1.6100 (48)
a) If manufacturer declared loss factor is known (kwh/day):												0.5400 (49)
Temperature factor from Table 2b												0.8694 (55)
Enter (49) or (54) in (55)												
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (57)
Primary 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 (59)
Total heat required for water heating calculated for each month	171.9632	151.1714	157.8268	140.1823	136.4334	120.5566	114.4960	127.4101	127.7405	145.4246	155.4048	167.3876 (62)
Solar input	0.0000	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	171.9632	151.1714	157.8268	140.1823	136.4334	120.5566	114.4960	127.4101	127.7405	145.4246	155.4048	167.3876 (64)
RHI water heating demand												1715.9975 (64)
Heat gains from water heating, kwh/month	48.2164	42.1704	43.5161	37.9384	36.4028	31.4128	29.1086	33.4025	33.8015	39.3923	42.9998	46.6950 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	138.1772	138.1772	138.1772	138.1772	138.1772	138.1772	138.1772	138.1772	138.1772	138.1772	138.1772	138.1772 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	45.8127	40.6905	33.0917	25.0526	18.7271	15.8102	17.0835	22.2057	29.8045	37.8436	44.1691	47.0860 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	302.7350	305.8764	297.9601	281.1071	259.8333	239.8390	226.4815	223.3401	231.2564	248.1093	269.3831	289.3775 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.1207	51.1207	51.1207	51.1207	51.1207	51.1207	51.1207	51.1207	51.1207	51.1207	51.1207	51.1207 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181 (71)
Water heating gains (Table 5)	64.8070	62.7536	58.4893	52.6922	48.9284	43.6289	39.1244	44.8959	46.9465	52.9467	59.7220	62.7621 (72)
Total internal gains	510.5345	506.5002	486.7209	456.0316	424.6686	396.4578	379.8691	387.6214	405.1871	436.0794	470.4540	496.4054 (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			0.6900			11.9814	0.6300		0.7000		0.7700	2.5266 (74)
East			13.0500			22.3313	0.6300		0.7000		0.7700	89.0629 (76)
Solar gains	91.5894	161.1024	261.9174	393.7566	470.6479	516.0027	485.7673	426.2184	330.1781	204.0433	116.9682	74.6111 (83)
Total gains	602.1239	667.6026	748.6383	849.7882	895.3165	912.4605	865.6364	813.8398	735.3652	640.1227	587.4222	571.0165 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, n11,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	0.5391	0.8120	0.8120	0.1996	0.1996	0.6743	0.5602	0.7853	0.6743	0.4430	0.4430	0.0733
alpha	6.3693	6.3875	6.3875	6.4133	6.4133	6.4450	6.4373	6.4524	6.4450	6.4295	6.4295	6.4049
util living area	0.9833	0.9676	0.9114	0.7588	0.5476	0.3371	0.2208	0.2417	0.4831	0.8194	0.9600	0.9870 (86)
MIT	20.4517	20.5724	20.7756	20.9417	20.9931	20.9997	21.0000	21.0000	20.9976	20.9235	20.6728	20.4211 (87)
Th 2	20.1997	20.2022	20.2022	20.2057	20.2057	20.2100	20.2090	20.2110	20.2100	20.2079	20.2079	20.2046 (88)
util rest of house	0.9784	0.9587	0.8899	0.7171	0.4954	0.2840	0.1644	0.1821	0.4185	0.7733	0.9473	0.9832 (89)
MIT 2	19.4909	19.6637	19.9408	20.1480	20.2005	20.2099	20.2090	20.2110	20.2087	20.1348	19.8118	19.4513 (90)
Living area fraction	19.8439	19.9975	20.2475	20.4396	20.4917	20.5001	20.4996	20.5009	20.4985	20.4246	20.1281	19.8076 (92)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF HEAT DEMAND 09 Jan 2014

Temperature adjustment												0.0000
adjusted MIT	19.8439	19.9975	20.2475	20.4396	20.4917	20.5001	20.4996	20.5009	20.4985	20.4246	20.1281	19.8076 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9758	0.9560	0.8912	0.7298	0.5144	0.3035	0.1851	0.2040	0.4422	0.7867	0.9458	0.9808 (94)
Useful gains	587.5304	638.2519	667.2110	620.1680	460.5578	276.9306	160.2490	166.0313	325.2056	503.5773	555.5768	560.0384 (95)
Ext temp.	5.1000	5.6000	7.4000	9.0000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Heat loss rate W	920.4127	895.7536	799.3187	652.6000	463.8784	277.0195	160.2515	166.0359	326.1704	544.7737	748.7148	912.0940 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	247.6644	173.0411	98.2881	23.3510	2.4705	0.0000	0.0000	0.0000	0.0000	30.6502	139.0594	261.9293 (98)
Space heating												976.4541 (98)
RHI space heating demand												976 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.4000 (1b)	x 2.4000 (2b)	= 173.7600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.4000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 173.7600 (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) = 0.1151 (8)
Pressure test					Yes
Measured/design AP50					4.0000
Infiltration rate					0.3151 (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) =				0.2678 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infiltr rate	0.3415	0.3348	0.3281	0.2946	0.2879	0.2544	0.2544	0.2477	0.2678	0.2879	0.3013	0.3147 (22b)
Effective ac	0.5583	0.5560	0.5538	0.5434	0.5415	0.5324	0.5324	0.5307	0.5359	0.5415	0.5454	0.5495 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.9500	1.0000	1.9500		(26)
Window (Uw = 1.20)			13.7400	1.1450	15.7328		(27)
External Wall 1	51.6000	15.6900	35.9100	0.1800	6.4638		(29a)
shelterd wall			11.5200	0.1671	1.9246		(29a)
External Roof 1	19.9000		19.9000	0.0900	1.7910		(30)
Total net area of external elements Aum(A, m ²)			83.0200				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 27.8623		(33)
Party Wall 1			24.2400	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							3.6264 (36)
Total fabric heat loss						(33) + (36) =	31.4886 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	32.0138	31.8840	31.7567	31.1590	31.0472	30.5266	30.5266	30.4302	30.7271	31.0472	31.2734	31.5099 (38)
Heat transfer coeff	63.5024	63.3726	63.2454	62.6476	62.5358	62.0152	62.0152	61.9188	62.2157	62.5358	62.7620	62.9986 (39)
Average = Sum(39)m / 12 =												62.6471 (39)
HLP	0.8771	0.8753	0.8736	0.8653	0.8638	0.8566	0.8566	0.8552	0.8593	0.8638	0.8669	0.8701 (40)
HLP (average)												0.8653 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3030 (42)
Average daily hot water use (litres/day)												88.8951 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	97.7846	94.2288	90.6730	87.1172	83.5614	80.0056	80.0056	83.5614	87.1172	90.6730	94.2288	97.7846 (44)
Energy content (annual)	145.0118	126.8282	130.8754	114.1003	109.4820	94.4746	87.5446	100.4587	101.6585	118.4732	129.3228	140.4362 (45)
Distribution loss												Total = Sum(45)m = 1398.6665 (45)
(46)m = 0.15 x (45)m												
Water storage loss:	21.7518	19.0242	19.6313	17.1151	16.4223	14.1712	13.1317	15.0688	15.2488	17.7710	19.3984	21.0654 (46)
Store volume												201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100 (48)
Temperature factor from Table 2b												0.5400 (49)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

Enter (49) or (54) in (55)												0.8694 (55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (57)
Primary 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 (59)
Total heat required for water heating calculated for each month	171.9632	151.1714	157.8268	140.1823	136.4334	120.5566	114.4960	127.4101	127.7405	145.4246	155.4048	167.3876 (62)
Solar input	0.0000	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	171.9632	151.1714	157.8268	140.1823	136.4334	120.5566	114.4960	127.4101	127.7405	145.4246	155.4048	167.3876 (64)
Heat gains from water heating, kWh/month	48.2164	42.1704	43.5161	37.9384	36.4028	31.4128	29.1086	33.4025	33.8015	39.3923	42.9998	46.6950 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	138.1772	138.1772	138.1772	138.1772	138.1772	138.1772	138.1772	138.1772	138.1772	138.1772	138.1772	138.1772 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	45.8127	40.6905	33.0917	25.0526	18.7271	15.8102	17.0835	22.2057	29.8045	37.8436	44.1691	47.0860 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	302.7350	305.8764	297.9601	281.1071	259.8333	239.8390	226.4815	223.3401	231.2564	248.1093	269.3831	289.3775 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.1207	51.1207	51.1207	51.1207	51.1207	51.1207	51.1207	51.1207	51.1207	51.1207	51.1207	51.1207 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181 (71)
Water heating gains (Table 5)	64.8070	62.7536	58.4893	52.6922	48.9284	43.6289	39.1244	44.8959	46.9465	52.9467	59.7220	62.7621 (72)
Total internal gains	510.5345	506.5002	486.7209	456.0316	424.6686	396.4578	379.8691	387.6214	405.1871	436.0794	470.4540	496.4054 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d		Gains W	
North				0.6900	10.6334		0.6300	0.7000	0.7700		2.2423 (74)	
East				13.0500	19.6403		0.6300	0.7000	0.7700		78.3383 (76)	
Solar gains	80.5726	157.5158	259.6305	379.7320	466.7975	478.5885	455.3252	390.0844	302.2471	186.9220	100.4348	66.2843 (83)
Total gains	591.1070	664.0159	746.3514	835.7636	891.4661	875.0463	835.1943	777.7058	707.4342	623.0014	570.8888	562.6897 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, n _{li,m} (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	79.1745	79.3368	79.4964	80.2549	80.3984	81.0733	81.0733	81.1996	80.8120	80.3984	80.1086	79.8078
alpha	6.2783	6.2891	6.2998	6.3503	6.3599	6.4049	6.4049	6.4133	6.3875	6.3599	6.3406	6.3205
util living area	0.9886	0.9755	0.9346	0.8184	0.6367	0.4520	0.3265	0.3659	0.5968	0.8820	0.9754	0.9913 (86)
MIT	20.3500	20.4913	20.7002	20.8987	20.9809	20.9981	20.9998	20.9996	20.9902	20.8619	20.5684	20.3158 (87)
Th 2	20.1870	20.1885	20.1900	20.1971	20.1984	20.2046	20.2046	20.2057	20.2022	20.1984	20.1957	20.1930 (88)
util rest of house	0.9853	0.9688	0.9182	0.7828	0.5870	0.3966	0.2676	0.3029	0.5319	0.8475	0.9675	0.9887 (89)
MIT 2	19.3344	19.5374	19.8288	20.0900	20.1820	20.2034	20.2045	20.2056	20.1955	20.0536	19.6557	19.2897 (90)
Living area fraction	19.7075	19.8878	20.1489	20.3871	20.4755	20.4954	20.4967	20.4973	20.4875	20.3506	19.9910	19.6667 (92)
MIT	19.7075	19.8878	20.1489	20.3871	20.4755	20.4954	20.4967	20.4973	20.4875	20.3506	19.9910	19.6667 (93)
Temperature adjustment	19.7075	19.8878	20.1489	20.3871	20.4755	20.4954	20.4967	20.4973	20.4875	20.3506	19.9910	19.6667 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9828	0.9658	0.9172	0.7917	0.6045	0.4169	0.2893	0.3260	0.5555	0.8547	0.9650	0.9866 (94)
Ext temp.	580.9590	641.3130	684.5821	661.6604	538.8641	364.8083	241.5938	253.5700	392.9632	532.4616	550.9244	555.1596 (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	978.4160	949.8184	863.2327	719.6382	548.7846	365.6048	241.6548	253.6997	397.4029	609.7615	809.0671	974.3781 (97a)
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	295.7080	207.3156	132.9160	41.7440	7.3809	0.0000	0.0000	0.0000	0.0000	57.5111	185.8627	311.8986 (98)
Space heating per m ²												1240.3369 (98)
										(98) / (4) =		17.1317 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 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)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	1240.3369	(211)
Space heating requirement	295.7080	
Space heating efficiency (main heating system 1)	100.0000	
Space heating fuel (main heating system)	295.7080	
Space heating efficiency (main heating system 2)	0.0000	
Space heating fuel (main heating system 2)	0.0000	
Water heating requirement	0.0000	
Space heating fuel used, main system 2	0.0000	
Water heating requirement	171.9632	
Efficiency of water heater	349.4100	
Fuel for water heating, kWh/month	49.2153	
Water heating fuel used	491.1129	
Annual totals kWh/year		
Space heating fuel - main system		1240.3369 (211)
Space heating fuel - secondary		0.0000 (215)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year		0.0000 (231)
Electricity for lighting (calculated in Appendix L)		323.6269 (232)
Energy saving/generation technologies (Appendices M, N and Q)		
PV Unit 0 (0.80 * 0.50 * 1080 * 1.00) =	-431.8098	-431.8098 (233)
Total delivered energy for all uses		1623.2668 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1240.3369	13.1900	163.6004 (240)
Space heating - main system 2	0.0000	13.1900	0.0000 (241)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	491.1129	13.1900	64.7778 (247)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Energy for lighting	323.6269	13.1900	42.6864 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit	-431.8098	13.1900	-56.9557 (252)
Total energy cost			214.1089 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7660 (257)
SAP value		89.3146
SAP rating (Section 12)		89 (258)
SAP band		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1240.3369	0.5190	643.7348 (261)
Space heating - main system 2	0.0000	0.5190	0.0000 (262)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	491.1129	0.5190	254.8876 (264)
Space and water heating			898.6224 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	323.6269	0.5190	167.9624 (268)
Energy saving/generation technologies			
PV Unit	-431.8098	0.5190	-224.1093 (269)
Total kg/year			842.4755 (272)
CO2 emissions per m2			11.6400 (273)
EI value			90.3840
EI rating			90 (274)
EI band			B

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

Calculation of stars for heating and DHW

Main heating 1 energy efficiency	$13.19 \times (1 + 0.29 \times 0.00) / 1.0000 = 13.190$, stars = 1
Main heating 2 energy efficiency	(does water heating only)
Main heating 1 environmental impact	$0.519 \times (1 + 0.29 \times 0.00) / 1.0000 = 0.5190$, stars = 2
Main heating 2 environmental impact	(does water heating only)
Water heating energy efficiency	$13.19 / 3.4941 = 3.775$, stars = 5
Water heating environmental impact	$0.519 / 3.4941 = 0.1485$, stars = 5

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.4000 (1b)	x 2.4000 (2b)	= 173.7600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.4000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 173.7600 (5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour				
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000 (6a)				
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000 (6b)				
Number of intermittent fans							2 * 10 =	20.0000 (7a)				
Number of passive vents							0 * 10 =	0.0000 (7b)				
Number of flueless gas fires							0 * 40 =	0.0000 (7c)				
								Air changes per hour				
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						20.0000 / (5) =	0.1151 (8)				
Pressure test							Yes					
Measured/design AP50							4.0000					
Infiltration rate							0.3151 (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) =	0.2678 (21)				
Wind speed	Jan 4.2000	Feb 4.0000	Mar 4.0000	Apr 3.7000	May 3.7000	Jun 3.3000	Jul 3.4000	Aug 3.2000	Sep 3.3000	Oct 3.5000	Nov 3.5000	Dec 3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate	0.2812	0.2678	0.2678	0.2477	0.2477	0.2210	0.2277	0.2143	0.2210	0.2344	0.2344	0.2544 (22b)
Effective ac	0.5395	0.5359	0.5359	0.5307	0.5307	0.5244	0.5259	0.5230	0.5244	0.5275	0.5275	0.5324 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.9500	1.0000	1.9500		(26)					
Window (Uw = 1.20)			13.7400	1.1450	15.7328		(27)					
External Wall 1	51.6000	15.6900	35.9100	0.1800	6.4638		(29a)					
shelterd wall	11.5200		11.5200	0.1671	1.9246		(29a)					
External Roof 1	19.9000		19.9000	0.0900	1.7910		(30)					
Total net area of external elements Aum(A, m2)			83.0200				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	27.8623		(33)					
Party Wall 1			24.2400	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								3.6264 (36)				
Total fabric heat loss								(33) + (36) = 31.4886 (37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 30.9379	Feb 30.7271	Mar 30.7271	Apr 30.4302	May 30.4302	Jun 30.0702	Jul 30.1564	Aug 29.9867	Sep 30.0702	Oct 30.2451	Nov 30.2451	Dec 30.5266 (38)
Heat transfer coeff	62.4265	62.2157	62.2157	61.9188	61.9188	61.5589	61.6450	61.4753	61.5589	61.7337	61.7337	62.0152 (39)
Average = Sum(39)m / 12 =												61.8680 (39)
HLP	Jan 0.8622	Feb 0.8593	Mar 0.8593	Apr 0.8552	May 0.8552	Jun 0.8503	Jul 0.8515	Aug 0.8491	Sep 0.8503	Oct 0.8527	Nov 0.8527	Dec 0.8566 (40)
HLP (average)												0.8545 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3030 (42)
Average daily hot water use (litres/day)												88.8951 (43)
Daily hot water use	Jan 97.7846	Feb 94.2288	Mar 99.6730	Apr 87.1172	May 83.5614	Jun 80.0056	Jul 80.0056	Aug 83.5614	Sep 87.1172	Oct 99.6730	Nov 94.2288	Dec 97.7846 (44)
Energy conte	145.0118	126.8282	130.8754	114.1003	109.4820	94.4746	87.5446	100.4587	101.6585	118.4732	129.3228	140.4362 (45)
Energy content (annual)										Total = Sum(45)m =		1398.6665 (45)
Distribution loss	21.7518	19.0242	19.6313	17.1151	16.4223	14.1712	13.1317	15.0688	15.2488	17.7710	19.3984	21.0654 (46)
Water storage loss:												
Store volume												201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100 (48)
Temperature factor from Table 2b												0.5400 (49)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

Enter (49) or (54) in (55)												0.8694 (55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (57)
Primary 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 (59)
Total heat required for water heating calculated for each month	171.9632	151.1714	157.8268	140.1823	136.4334	120.5566	114.4960	127.4101	127.7405	145.4246	155.4048	167.3876 (62)
Solar input	0.0000	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	171.9632	151.1714	157.8268	140.1823	136.4334	120.5566	114.4960	127.4101	127.7405	145.4246	155.4048	167.3876 (64)
Heat gains from water heating, kWh/month	48.2164	42.1704	43.5161	37.9384	36.4028	31.4128	29.1086	33.4025	33.8015	39.3923	42.9998	46.6950 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	138.1772	138.1772	138.1772	138.1772	138.1772	138.1772	138.1772	138.1772	138.1772	138.1772	138.1772	138.1772 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	45.8127	40.6905	33.0917	25.0526	18.7271	15.8102	17.0835	22.2057	29.8045	37.8436	44.1691	47.0860 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	302.7350	305.8764	297.9601	281.1071	259.8333	239.8390	226.4815	223.3401	231.2564	248.1093	269.3831	289.3775 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.1207	51.1207	51.1207	51.1207	51.1207	51.1207	51.1207	51.1207	51.1207	51.1207	51.1207	51.1207 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181 (71)
Water heating gains (Table 5)	64.8070	62.7536	58.4893	52.6922	48.9284	43.6289	39.1244	44.8959	46.9465	52.9467	59.7220	62.7621 (72)
Total internal gains	510.5345	506.5002	486.7209	456.0316	424.6686	396.4578	379.8691	387.6214	405.1871	436.0794	470.4540	496.4054 (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				0.6900			11.9814	0.6300		0.7000			0.7700			2.5266 (74)
East				13.0500			22.3313	0.6300		0.7000			0.7700			89.0629 (76)
Solar gains	91.5894	161.1024	261.9174	393.7566	470.6479	516.0027	485.7673	426.2184	330.1781	204.0433	116.9682	74.6111	(83)			
Total gains	602.1239	667.6026	748.6383	849.7882	895.3165	912.4605	865.6364	813.8398	735.3652	640.1227	587.4222	571.0165	(84)			

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, n1,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	80.5391	80.8120	80.8120	81.1996	81.1996	81.6743	81.5602	81.7853	81.6743	81.4430	81.4430	81.0733
alpha	6.3693	6.3875	6.3875	6.4133	6.4133	6.4450	6.4373	6.4524	6.4450	6.4295	6.4295	6.4049
util living area	0.9833	0.9676	0.9114	0.7588	0.5476	0.3371	0.2208	0.2417	0.4831	0.8194	0.9600	0.9870 (86)
MIT	20.4517	20.5724	20.7756	20.9417	20.9931	20.9997	21.0000	21.0000	20.9976	20.9235	20.6728	20.4211 (87)
Th 2	20.1997	20.2022	20.2022	20.2057	20.2057	20.2100	20.2090	20.2110	20.2100	20.2079	20.2079	20.2046 (88)
util rest of house	0.9784	0.9587	0.8899	0.7171	0.4954	0.2840	0.1644	0.1821	0.4185	0.7733	0.9473	0.9832 (89)
MIT 2	19.4909	19.6637	19.9408	20.1480	20.2005	20.2099	20.2090	20.2110	20.2087	20.1348	19.8118	19.4513 (90)
Living area fraction	19.8439	19.9975	20.2475	20.4396	20.4917	20.5001	20.4996	20.5009	20.4985	20.4246	20.1281	19.8076 (91)
MIT	19.8439	19.9975	20.2475	20.4396	20.4917	20.5001	20.4996	20.5009	20.4985	20.4246	20.1281	19.8076 (92)
Temperature adjustment	19.8439	19.9975	20.2475	20.4396	20.4917	20.5001	20.4996	20.5009	20.4985	20.4246	20.1281	19.8076 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9758	0.9500	0.8912	0.7298	0.5144	0.3035	0.1851	0.2040	0.4422	0.7867	0.9458	0.9808 (94)
Ext temp.	587.5384	638.2519	667.2110	620.1680	460.5578	276.9306	160.2490	166.0313	325.2056	503.5773	555.5768	500.0384 (95)
Heat loss rate w	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Month fracti	920.4127	895.7536	799.3187	652.6000	463.8784	277.0195	160.2515	166.0359	326.1704	544.7737	748.7148	912.0940 (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	247.6644	173.0411	98.2881	23.3510	2.4705	0.0000	0.0000	0.0000	0.0000	30.6502	139.0594	261.9293 (98)
Space heating per m2										(98) / (4) =		13.4869 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 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)
Fraction of main heating from main system 2													0.0000 (203)
Fraction of total heating from main system 1													1.0000 (204)
Fraction of total heating from main system 2													0.0000 (205)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													976.4541 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	247.6644	173.0411	98.2881	23.3510	2.4705	0.0000	0.0000	0.0000	0.0000	30.6502	139.0594	261.9293	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	247.6644	173.0411	98.2881	23.3510	2.4705	0.0000	0.0000	0.0000	0.0000	30.6502	139.0594	261.9293	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Water heating requirement	171.9632	151.1714	157.8268	140.1823	136.4334	120.5566	114.4960	127.4101	127.7405	145.4246	155.4048	167.3876	(64)
Efficiency of water heater (217)m	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	(216)
Fuel for water heating, kWh/month	49.2153	43.2648	45.1695	40.1197	39.0468	34.5029	32.7684	36.4644	36.5589	41.6201	44.4763	47.9058	(219)
Water heating fuel used													(219)
Annual totals kWh/year													
Space heating fuel - main system													976.4541 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year													0.0000 (231)
Electricity for lighting (calculated in Appendix L)													323.6269 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.50 * 1140 * 1.00) =										-456.0399			-456.0399 (233)
Total delivered energy for all uses													1335.1540 (238)

10a. Fuel costs - using BEDF prices (554)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	976.4541	25.0500	244.6017 (240)
Space heating - main system 2	0.0000	25.0500	0.0000 (241)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	491.1129	25.0500	123.0238 (247)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Energy for lighting	323.6269	25.0500	81.0685 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit	-456.0399	25.0500	-114.2380 (252)
Total energy cost			334.4561 (255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	976.4541	0.5190	506.7797 (261)
Space heating - main system 2	0.0000	0.5190	0.0000 (262)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	491.1129	0.5190	254.8876 (264)
Space and water heating			761.6673 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	323.6269	0.5190	167.9624 (268)
Energy saving/generation technologies			
PV Unit	-456.0399	0.5190	-236.6847 (269)
Total kg/year			692.9449 (272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	976.4541	3.0700	2997.7140 (261)
Space heating - main system 2	0.0000	3.0700	0.0000 (262)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	491.1129	3.0700	1507.7165 (264)
Space and water heating			4505.4306 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	323.6269	3.0700	993.5346 (268)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

Energy saving/generation technologies			
PV unit	-456.0399	3.0700	-1400.0425 (269)
Primary energy kwh/year			4098.9226 (272)
Primary energy kwh/m2/year			56.6150 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 89
Current environmental impact rating: B 90

(For testing purposes):	
A	Not considered
B	Not considered
C	Not considered
D	Not considered
E Low energy lighting	Already installed
F	Not considered
G	Not considered
H	Not considered
I	Not considered
J	Not considered
K	Not considered
M	Not considered
N Solar water heating	Not applicable
O	Not considered
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U Solar photovoltaic panels	Not applicable
A2	Not considered
A3	Not considered
T2	Not considered
W	Not considered
X	Not considered
Y	Not considered
J2	Not considered
Q2	Not considered
Z1	Not considered
Z2	Not considered
Z3	Not considered
Z4	Not considered
Z5	Not considered
V2 Wind turbine	Not applicable
L2	Not considered
Q3	Not considered
O3	Not considered

Recommended measures: SAP change Cost change CO2 change
(none)

Recommended measures (none)	Typical annual savings	Energy efficiency	Environmental impact
	Total Savings £0		0.00 kg/m²

Potential energy efficiency rating: B 89
Potential environmental impact rating: B 90

Fuel prices for cost data on this page from database revision number 554 TEST (31 Oct 2024)
Recommendation texts revision number 4.9c (22 Feb 2014)

Typical heating and lighting costs of this home (per year, Thames Valley):			
	Current	Potential	Saving
Electricity	£449	£449	£0
Space heating	£245	£245	£0
Water heating	£123	£123	£0
Lighting	£81	£81	£0
Generated (PV)	-£114	-£114	£0
Total cost of fuels	£335	£335	£0
Total cost of uses	£335	£335	£0
Delivered energy	18 kWh/m²	18 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.7 tonnes	0.7 tonnes	0.0 tonnes
CO2 emissions per m²	10 kg/m²	10 kg/m²	0 kg/m²
Primary energy	57 kWh/m²	57 kWh/m²	0 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	2455-06 - Flat 9	Issued on Date	05/05/2025
Assessment Reference	009	Prop Type Ref	
Property			

SAP Rating	92 A	DER	14.37	TER	25.13
Environmental	93 A	% DER<TER	42.81		
CO ₂ Emissions (t/year)	0.42	DFEE	28.21	TFEE	37.01
General Requirements Compliance	Pass	% DFEE<TFEE	23.78		

Assessor Details	Mrs. Naomi Sadler, Sadler Energy & Environmental Services Ltd, Tel: 01962 718870, naomi.sadler@sadlerenergy.co.uk	Assessor ID	4611-0001
Client	RHB PARTNERSHIP LLP , RHB		

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	51.5000 (1b)	2.4000 (2b)	123.6000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.5000		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 123.6000 (5)
Dwelling volume			

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour				
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000 (6a)				
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000 (6b)				
Number of intermittent fans							2 * 10 =	20.0000 (7a)				
Number of passive vents							0 * 10 =	0.0000 (7b)				
Number of flueless gas fires							0 * 40 =	0.0000 (7c)				
								Air changes per hour				
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						20.0000 / (5) =	0.1618 (8)				
Pressure test							Yes					
Measured/design AP50							4.0000					
Infiltration rate							0.3618 (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) =	0.3075 (21)				
Wind speed	Jan 4.2000	Feb 4.0000	Mar 4.0000	Apr 3.7000	May 3.7000	Jun 3.3000	Jul 3.4000	Aug 3.2000	Sep 3.3000	Oct 3.5000	Nov 3.5000	Dec 3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate	0.3229	0.3075	0.3075	0.2845	0.2845	0.2537	0.2614	0.2460	0.2537	0.2691	0.2691	0.2922 (22b)
Effective ac	0.5521	0.5473	0.5473	0.5405	0.5405	0.5322	0.5342	0.5303	0.5322	0.5362	0.5362	0.5427 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Door			1.9500	1.0000	1.9500		(26)
Window (Uw = 1.20)			9.6800	1.1450	11.0840		(27)
External Wall 1	34.8000	11.6300	23.1700	0.1800	4.1706		(29a)
shelterd wall	12.2400		12.2400	0.1671	2.0449		(29a)
Total net area of external elements Aum(A, m2)			47.0400				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.2495		(33)
Party Wall 1			16.5600	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							2.1252 (36)
Total fabric heat loss							(33) + (36) = 21.3747 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	Jan 22.5206	Feb 22.3229	Mar 22.3229	Apr 22.0444	May 22.0444	Jun 21.7068	Jul 21.7876
Heat transfer coeff	43.8953	43.6976	43.6976	43.4191	43.4191	43.0816	43.1624
Average = Sum(39)m / 12 =	43.8953	43.6976	43.6976	43.4191	43.4191	43.0816	43.1624
	43.8953	43.6976	43.6976	43.4191	43.4191	43.0816	43.1624
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	43.8953	43.6976	43.6976	43.4191	43.4191	43.0816	43.1624
	43.8953	43.6976	43.6976	43.4191	43.4191	43.0816	43.1624

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF HEAT DEMAND 09 Jan 2014

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8523	0.8485	0.8485	0.8431	0.8431	0.8365	0.8381	0.8350	0.8365	0.8397	0.8397	0.8448 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kwh/year)

Assumed occupancy												1.7343 (42)
Average daily hot water use (litres/day)												75.3901 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	82.9291	79.9135	76.8979	73.8823	70.8667	67.8511	67.8511	70.8667	73.8823	76.8979	79.9135	82.9291 (44)
Energy content (annual)	122.9815	107.5604	110.9927	96.7661	92.8494	80.1220	74.2448	85.1970	86.2145	100.4747	109.6759	119.1010 (45)
Distribution loss (46)m = 0.15 x (45)m	18.4472	16.1341	16.6489	14.5149	13.9274	12.0183	11.1367	12.7795	12.9322	15.0712	16.4514	17.8651 (46)
Water storage loss:												201.0000 (47)
Store volume												1.6100 (48)
a) If manufacturer declared loss factor is known (kwh/day):												0.5400 (49)
Temperature factor from Table 2b												0.8694 (55)
Enter (49) or (54) in (55)												0.8694 (55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (57)
Primary 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 (59)
Total heat required for water heating calculated for each month	149.9329	131.9036	137.9441	122.8481	119.8008	106.2040	101.1962	112.1484	112.2965	127.4261	135.7579	146.0524 (62)
Solar input	0.0000	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	149.9329	131.9036	137.9441	122.8481	119.8008	106.2040	101.1962	112.1484	112.2965	127.4261	135.7579	146.0524 (64)
RHI water heating demand												1503.5107 (64)
Heat gains from water heating, kwh/month	40.8913	35.7638	36.9051	32.1747	30.8724	26.6405	24.6864	28.3280	28.6663	33.4078	36.4673	39.6011 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	104.0592	104.0592	104.0592	104.0592	104.0592	104.0592	104.0592	104.0592	104.0592	104.0592	104.0592	104.0592 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	34.1798	30.3582	24.6889	18.6911	13.9718	11.7956	12.7456	16.5672	22.2364	28.2343	32.9535	35.1298 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	225.5652	227.9059	222.0075	209.4505	193.5996	178.7019	168.7494	166.4087	172.3071	184.8641	200.7150	215.6127 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.1402	47.1402	47.1402	47.1402	47.1402	47.1402	47.1402	47.1402	47.1402	47.1402	47.1402	47.1402 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-69.3728	-69.3728	-69.3728	-69.3728	-69.3728	-69.3728	-69.3728	-69.3728	-69.3728	-69.3728	-69.3728	-69.3728 (71)
Water heating gains (Table 5)	54.9615	53.2200	49.6036	44.6871	41.4952	37.0008	33.1806	38.0753	39.8143	44.9030	50.6490	53.2273 (72)
Total internal gains	396.5331	393.3107	378.1266	354.6554	330.8932	309.3249	296.5022	302.8778	316.1845	339.8280	366.1442	385.7963 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W		
West					9.6800	22.3313	0.6300	0.7000	0.7700	66.0635 (80)		
Solar gains	66.0635	116.2483	188.7667	282.9071	337.0958	369.0130	347.6251	305.8277	237.7086	147.2013	84.3880	53.8003 (83)
Total gains	462.5966	509.5589	566.8933	637.5625	667.9890	678.3379	644.1274	608.7055	553.8931	487.0292	450.5322	439.5966 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nll,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	81.4754	81.8440	81.8440	82.3690	82.3690	83.0143	82.8590	83.1656	83.0143	82.6996	82.6996	82.1978
alpha	6.4317	6.4563	6.4563	6.4913	6.4913	6.5343	6.5239	6.5444	6.5343	6.5133	6.5133	6.4799
util living area	0.9749	0.9539	0.8854	0.7217	0.5164	0.3174	0.2077	0.2261	0.4498	0.7774	0.9421	0.9800 (86)
MIT	20.5238	20.6394	20.8218	20.9579	20.9953	20.9998	21.0000	21.0000	20.9985	20.9461	20.7337	20.4960 (87)
Th 2	20.2082	20.2115	20.2115	20.2161	20.2161	20.2218	20.2264	20.2231	20.2218	20.2190	20.2190	20.2146 (88)
util rest of house	0.9680	0.9422	0.8604	0.6798	0.4672	0.2681	0.1555	0.1712	0.3901	0.7290	0.9253	0.9744 (89)
MIT 2	19.5999	19.7638	20.0078	20.1751	20.2127	20.2217	20.2204	20.2231	20.2210	20.1690	19.9033	19.5661 (90)
Living area fraction	20.0394	20.1804	20.3950	20.5475	20.5850	20.5919	20.5913	20.5927	20.5909	20.5387	20.2983	20.0085 (92)
MIT	20.0394	20.1804	20.3950	20.5475	20.5850	20.5919	20.5913	20.5927	20.5909	20.5387	20.2983	20.0085 (93)
Temperature adjustment												0.0000
adjusted MIT	20.0394	20.1804	20.3950	20.5475	20.5850	20.5919	20.5913	20.5927	20.5909	20.5387	20.2983	20.0085 (93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF HEAT DEMAND 09 Jan 2014

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9663	0.9416	0.8666	0.6979	0.4905	0.2916	0.1803	0.1973	0.4185	0.7496	0.9272	0.9726 (94)
Useful gains	446.9857	479.8261	491.2784	444.9711	327.6321	197.7812	116.1611	120.0919	231.7865	365.0617	417.7269	427.5524 (95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Heat loss rate W	655.7717	637.1276	567.8523	462.3052	329.3348	197.8259	116.1624	120.0943	232.2478	386.5573	531.8480	648.6629 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	155.3367	105.7066	56.9710	12.4806	1.2668	0.0000	0.0000	0.0000	0.0000	15.9928	82.1672	164.5062 (98)
Space heating												594.4280 (98)
RHI space heating demand												594 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	51.5000 (1b)	2.4000 (2b)	123.6000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.5000		123.6000 (4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 123.6000 (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) =	0.1618 (8)
Pressure test				Yes	4.0000
Measured/design AP50					0.3618 (18)
Infiltration rate					2 (19)
Number of sides sheltered					
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3075 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infiltr rate	0.3921	0.3844	0.3767	0.3383	0.3306	0.2922	0.2922	0.2845	0.3075	0.3306	0.3460	0.3614 (22b)
Effective ac	0.5769	0.5739	0.5710	0.5572	0.5547	0.5427	0.5427	0.5405	0.5473	0.5547	0.5599	0.5653 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.9500	1.0000	1.9500		(26)
Window (Uw = 1.20)			9.6800	1.1450	11.0840		(27)
External Wall 1	34.8000	11.6300	23.1700	0.1800	4.1706		(29a)
shelterd wall	12.2400		12.2400	0.1671	2.0449		(29a)
Total net area of external elements Aum(A, m ²)			47.0400				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	19.2495			(33)
Party Wall 1			16.5600	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							2.1252 (36)
Total fabric heat loss						(33) + (36) =	21.3747 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	23.5296	23.4079	23.2885	22.7280	22.6231	22.1348	22.1348
Heat transfer coeff	44.9044	44.7826	44.6633	44.1027	43.9978	43.5096	43.5096
Average = Sum(39)m / 12 =							
HLP	0.8719	0.8696	0.8672	0.8564	0.8543	0.8448	0.8448
HLP (average)							
Days in month	31	28	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7343 (42)
Average daily hot water use (litres/day)												75.3901 (43)
Daily hot water use	82.9291	79.9135	76.8979	73.8823	70.8667	67.8511	67.8511	70.8667	73.8823	76.8979	79.9135	82.9291 (44)
Energy conte	122.9815	107.5604	110.9927	96.7661	92.8494	80.1220	74.2448	85.1970	86.2145	100.4747	109.6759	119.1010 (45)
Energy content (annual)										Total = Sum(45)m =		1186.1797 (45)
Distribution loss	18.4472	16.1341	16.6489	14.5149	13.9274	12.0183	11.1367	12.7795	12.9322	15.0712	16.4514	17.8651 (46)
Water storage loss:												
Store volume												201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8694 (55)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (57)
Primary 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 (59)
Total heat required for water heating calculated for each month	149.9329	131.9036	137.9441	122.8481	119.8008	106.2040	101.1962	112.1484	112.2965	127.4261	135.7579	146.0524 (62)
Solar input	0.0000	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	149.9329	131.9036	137.9441	122.8481	119.8008	106.2040	101.1962	112.1484	112.2965	127.4261	135.7579	146.0524 (64)
Heat gains from water heating, kWh/month	40.8913	35.7638	36.9051	32.1747	30.8724	26.6405	24.6864	28.3280	28.6663	33.4078	36.4673	39.6011 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	104.0592	104.0592	104.0592	104.0592	104.0592	104.0592	104.0592	104.0592	104.0592	104.0592	104.0592	104.0592 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	34.1798	30.3582	24.6889	18.6911	13.9718	11.7956	12.7456	16.5672	22.2364	28.2343	32.9535	35.1298 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	225.5652	227.9059	222.0075	209.4505	193.5996	178.7019	168.7494	166.4087	172.3071	184.8641	200.7150	215.6127 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.1402	47.1402	47.1402	47.1402	47.1402	47.1402	47.1402	47.1402	47.1402	47.1402	47.1402	47.1402 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-69.3728	-69.3728	-69.3728	-69.3728	-69.3728	-69.3728	-69.3728	-69.3728	-69.3728	-69.3728	-69.3728	-69.3728 (71)
Water heating gains (Table 5)	54.9615	53.2200	49.6036	44.6871	41.4952	37.0008	33.1806	38.0753	39.8143	44.9030	50.6490	53.2273 (72)
Total internal gains	396.5331	393.3107	378.1266	354.6554	330.8932	309.3249	296.5022	302.8778	316.1845	339.8280	366.1442	385.7963 (73)

6. Solar gains

[Jan]	Area m2		Solar Flux Table 6a W/m2		Specific data or Table 6b		Specific data or Table 6c		Access factor Table 6d		Gains W	
West	9.6800		19.6403		0.6300		0.7000		0.7700		58.1025 (80)	
Solar gains	58.1025	113.6607	187.1830	272.9953	334.5660	326.0624	280.0828	217.7016	134.8680	72.4469	47.7806 (83)	
Total gains	454.6356	506.9714	565.3097	627.6507	665.4592	651.8128	622.5646	582.9606	533.8861	474.6960	438.5911	433.5769 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, n1,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	79.6445	79.8611	80.0745	81.0923	81.2856	82.1978	82.1978	82.3690	81.8440	81.2856	80.8955	80.4916
alpha	6.3096	6.3241	6.3383	6.4062	6.4190	6.4799	6.4799	6.4913	6.4563	6.4190	6.3930	6.3661
util living area	0.9828	0.9654	0.9149	0.7858	0.6042	0.4262	0.3074	0.3424	0.5585	0.8488	0.9639	0.9866 (86)
MIT	20.4178	20.5549	20.7493	20.9221	20.9862	20.9988	20.9999	20.9998	20.9936	20.8947	20.6307	20.3867 (87)
Th 2	20.1914	20.1934	20.1954	20.2048	20.2065	20.2146	20.2146	20.2161	20.2115	20.2065	20.2030	20.1993 (88)
util rest of house	0.9781	0.9564	0.8953	0.7487	0.5562	0.3744	0.2526	0.2842	0.4973	0.8102	0.9530	0.9828 (89)
MIT 2	19.4348	19.6305	19.8982	20.1239	20.1948	20.2139	20.2146	20.2160	20.2072	20.0990	19.7479	19.3967 (90)
Living area fraction	19.9025	20.0703	20.3031	20.5036	20.5713	20.5873	20.5882	20.5889	20.5813	20.4775	20.1679	0.4757 (91)
MIT	19.9025	20.0703	20.3031	20.5036	20.5713	20.5873	20.5882	20.5889	20.5813	20.4775	20.1679	19.8677 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9025	20.0703	20.3031	20.5036	20.5713	20.5873	20.5882	20.5889	20.5813	20.4775	20.1679	19.8677 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9761	0.9549	0.8982	0.7631	0.5785	0.3990	0.2787	0.3119	0.5263	0.8242	0.9524	0.9809 (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	709.6187	679.3648	616.4901	511.7504	390.3190	260.5034	173.5236	181.8776	283.2167	434.5889	577.7306	696.1434 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	191.1099	131.2299	80.9152	23.6027	3.9856	0.0000	0.0000	0.0000	0.0000	32.2603	115.2041	281.5095 (98)
Space heating												779.8173 (98)
Space heating per m2										(98) / (4) =		15.1421 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 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)
Fraction of main heating from main system 2													0.0000 (203)
Fraction of total heating from main system 1													1.0000 (204)
Fraction of total heating from main system 2													0.0000 (205)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													779.8173 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	191.1099	131.2299	80.9152	23.6027	3.9856	0.0000	0.0000	0.0000	0.0000	32.2603	115.2041	201.5095	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	191.1099	131.2299	80.9152	23.6027	3.9856	0.0000	0.0000	0.0000	0.0000	32.2603	115.2041	201.5095	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Water heating requirement	149.9329	131.9036	137.9441	122.8481	119.8008	106.2040	101.1962	112.1484	112.2965	127.4261	135.7579	146.0524	(64)
Efficiency of water heater (217)m	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	(216)
Fuel for water heating, kWh/month	42.9103	37.7504	39.4791	35.1587	34.2866	30.3952	28.9620	32.0965	32.1389	36.4689	38.8535	41.7997	(219)
Water heating fuel used												430.2999	(219)
Annual totals kWh/year													
Space heating fuel - main system												779.8173	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												241.4504	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.50 * 1000 * 1.00) =											-431.8098	-431.8098	(233)
Total delivered energy for all uses												1019.7577	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	779.8173	13.1900	102.8579 (240)
Space heating - main system 2	0.0000	13.1900	0.0000 (241)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	430.2999	13.1900	56.7566 (247)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Energy for lighting	241.4504	13.1900	31.8473 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit	-431.8098	13.1900	-56.9557 (252)
Total energy cost			134.5060 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.5854 (257)
SAP value		91.8335
SAP rating (Section 12)		92 (258)
SAP band		A

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	779.8173	0.5190	404.7252 (261)
Space heating - main system 2	0.0000	0.5190	0.0000 (262)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	430.2999	0.5190	223.3256 (264)
Space and water heating			628.0508 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	241.4504	0.5190	125.3128 (268)
Energy saving/generation technologies			
PV Unit	-431.8098	0.5190	-224.1093 (269)
Total kg/year			529.2543 (272)
CO2 emissions per m2			10.2800 (273)
EI value			92.6508
EI rating			93 (274)
EI band			A

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

Calculation of stars for heating and DHW

Main heating 1 energy efficiency	$13.19 \times (1 + 0.29 \times 0.00) / 1.0000 = 13.190$, stars = 1
Main heating 2 energy efficiency	(does water heating only)
Main heating 1 environmental impact	$0.519 \times (1 + 0.29 \times 0.00) / 1.0000 = 0.5190$, stars = 2
Main heating 2 environmental impact	(does water heating only)
Water heating energy efficiency	$13.19 / 3.4941 = 3.775$, stars = 5
Water heating environmental impact	$0.519 / 3.4941 = 0.1485$, stars = 5

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	51.5000 (1b)	x 2.4000 (2b)	= 123.6000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.5000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	123.6000 (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) =	0.1618 (8)
Pressure test				Yes	
Measured/design AP50				4.0000	
Infiltration rate				0.3618 (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) =	0.3075 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infiltr rate	0.3229	0.3075	0.3075	0.2845	0.2845	0.2537	0.2614	0.2460	0.2537	0.2691	0.2691	0.2922 (22b)
Effective ac	0.5521	0.5473	0.5473	0.5405	0.5405	0.5322	0.5342	0.5303	0.5322	0.5362	0.5362	0.5427 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.9500	1.0000	1.9500		(26)					
Window (Uw = 1.20)			9.6800	1.1450	11.0840		(27)					
External Wall 1	34.8000	11.6300	23.1700	0.1800	4.1706		(29a)					
shelterd wall	12.2400		12.2400	0.1671	2.0449		(29a)					
Total net area of external elements Aum(A, m2)			47.0400				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.2495		(33)					
Party Wall 1			16.5600	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								2.1252 (36)				
Total fabric heat loss								(33) + (36) = 21.3747 (37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	22.5206	22.3229	22.3229	22.0444	22.0444	21.7068	21.7876	21.6285	21.7068	21.8708	21.8708	22.1348 (38)
Average = Sum(39)m / 12 =	43.8953	43.6976	43.6976	43.4191	43.4191	43.0816	43.1624	43.0032	43.0816	43.2455	43.2455	43.5096 (39)
												43.3715 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8523	0.8485	0.8485	0.8431	0.8431	0.8365	0.8381	0.8350	0.8365	0.8397	0.8397	0.8448 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.7343 (42)
Average daily hot water use (litres/day)													75.3901 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	82.9291	79.9135	76.8979	73.8823	70.8667	67.8511	67.8511	70.8667	73.8823	76.8979	79.9135	82.9291	(44)
Energy content (annual)	122.9815	107.5604	110.9927	96.7661	92.8494	80.1220	74.2448	85.1970	86.2145	100.4747	109.6759	119.1010	(45)
Distribution loss	(46)m = 0.15 x (45)m									Total = Sum(45)m =		1186.1797	(45)
	18.4472	16.1341	16.6489	14.5149	13.9274	12.0183	11.1367	12.7795	12.9322	15.0712	16.4514	17.8651	(46)
Water storage loss:													
Store volume													201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.6100 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.8694 (55)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (57)
Primary 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 (59)
Total heat required for water heating calculated for each month	149.9329	131.9036	137.9441	122.8481	119.8008	106.2040	101.1962	112.1484	112.2965	127.4261	135.7579	146.0524 (62)
Solar input	0.0000	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	149.9329	131.9036	137.9441	122.8481	119.8008	106.2040	101.1962	112.1484	112.2965	127.4261	135.7579	146.0524 (64)
Heat gains from water heating, kWh/month	40.8913	35.7638	36.9051	32.1747	30.8724	26.6405	24.6864	28.3280	28.6663	33.4078	36.4673	39.6011 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	104.0592	104.0592	104.0592	104.0592	104.0592	104.0592	104.0592	104.0592	104.0592	104.0592	104.0592	104.0592 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	34.1798	30.3582	24.6889	18.6911	13.9718	11.7956	12.7456	16.5672	22.2364	28.2343	32.9535	35.1298 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	225.5652	227.9059	222.0075	209.4505	193.5996	178.7019	168.7494	166.4087	172.3071	184.8641	200.7150	215.6127 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.1402	47.1402	47.1402	47.1402	47.1402	47.1402	47.1402	47.1402	47.1402	47.1402	47.1402	47.1402 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-69.3728	-69.3728	-69.3728	-69.3728	-69.3728	-69.3728	-69.3728	-69.3728	-69.3728	-69.3728	-69.3728	-69.3728 (71)
Water heating gains (Table 5)	54.9615	53.2200	49.6036	44.6871	41.4952	37.0008	33.1806	38.0753	39.8143	44.9030	50.6490	53.2273 (72)
Total internal gains	396.5331	393.3107	378.1266	354.6554	330.8932	309.3249	296.5022	302.8778	316.1845	339.8280	366.1442	385.7963 (73)

6. Solar gains

[Jan]	Area m2		Solar Flux Table 6a W/m2		Specific data or Table 6b		Specific data or Table 6c		FF Table 6d		Access factor Table 6d		Gains W	
West	9.6800		22.3313		0.6300		0.7000		0.7700				66.0635 (80)	
Solar gains	66.0635	116.2483	188.7667	282.9071	337.0958	369.0130	347.6251	305.8277	237.7086	147.2013	84.3880		53.8003	(83)
Total gains	462.5966	509.5589	566.8933	637.5625	667.9890	678.3379	644.1274	608.7055	553.8931	487.0292	450.5322		439.5966	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000 (85)											
Utilisation factor for gains for living area, n1,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	81.4754	81.8440	81.8440	82.3690	82.3690	83.0143	82.8590	83.1656	83.0143	82.6996	82.6996	82.1978
alpha	6.4317	6.4563	6.4563	6.4913	6.4913	6.5343	6.5239	6.5444	6.5343	6.5133	6.5133	6.4799
util living area	0.9749	0.9539	0.8854	0.7217	0.5164	0.3174	0.2077	0.2261	0.4498	0.7774	0.9421	0.9800 (86)
MIT	20.5238	20.6394	20.8218	20.9579	20.9953	20.9998	21.0000	21.0000	20.9985	20.9461	20.7337	20.4960 (87)
Th 2	20.2082	20.2115	20.2115	20.2161	20.2161	20.2218	20.2204	20.2231	20.2218	20.2190	20.2190	20.2146 (88)
util rest of house	0.9680	0.9422	0.8604	0.6798	0.4672	0.2681	0.1555	0.1712	0.3901	0.7290	0.9253	0.9744 (89)
MIT 2	19.5999	19.7638	20.0078	20.1751	20.2127	20.2217	20.2204	20.2231	20.2210	20.1690	19.9033	19.5661 (90)
Living area fraction	20.0394	20.1804	20.3950	20.5475	20.5850	20.5919	20.5913	20.5927	20.5909	20.5387	20.2983	20.0085 (92)
MIT	20.0394	20.1804	20.3950	20.5475	20.5850	20.5919	20.5913	20.5927	20.5909	20.5387	20.2983	20.0085 (93)
Temperature adjustment	20.0394	20.1804	20.3950	20.5475	20.5850	20.5919	20.5913	20.5927	20.5909	20.5387	20.2983	20.0085 (93)
adjusted MIT	20.0394	20.1804	20.3950	20.5475	20.5850	20.5919	20.5913	20.5927	20.5909	20.5387	20.2983	20.0085 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9663	0.9416	0.8666	0.6979	0.4905	0.2916	0.1803	0.1973	0.4185	0.7496	0.9272	0.9726 (94)
Ext temp.	446.9857	479.8261	491.2784	444.9711	327.6321	197.7812	116.1611	120.0919	231.7865	365.0617	417.7269	427.5524 (95)
Heat loss rate w	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Month fracti	655.7717	637.1276	567.8523	462.3052	329.3348	197.8259	116.1624	120.0943	232.2478	386.5573	531.8480	648.6629 (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	155.3367	105.7066	56.9710	12.4806	1.2668	0.0000	0.0000	0.0000	0.0000	15.9928	82.1672	164.5062 (98)
												594.4280 (98)
										(98) / (4) =		11.5423 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 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)
Fraction of main heating from main system 2													0.0000 (203)
Fraction of total heating from main system 1													1.0000 (204)
Fraction of total heating from main system 2													0.0000 (205)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													594.4280 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	155.3367	105.7066	56.9710	12.4806	1.2668	0.0000	0.0000	0.0000	0.0000	15.9928	82.1672	164.5062	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	155.3367	105.7066	56.9710	12.4806	1.2668	0.0000	0.0000	0.0000	0.0000	15.9928	82.1672	164.5062	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Water heating requirement	149.9329	131.9036	137.9441	122.8481	119.8008	106.2040	101.1962	112.1484	112.2965	127.4261	135.7579	146.0524	(64)
Efficiency of water heater (217)m	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	(216)
Fuel for water heating, kWh/month	42.9103	37.7504	39.4791	35.1587	34.2866	30.3952	28.9620	32.0965	32.1389	36.4689	38.8535	41.7997	(219)
Water heating fuel used												430.2999	(219)
Annual totals kWh/year													
Space heating fuel - main system												594.4280	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												241.4504	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.50 * 1140 * 1.00) =										-456.0399		-456.0399	(233)
Total delivered energy for all uses												810.1383	(238)

10a. Fuel costs - using BEDF prices (554)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	594.4280	25.0500	148.9042 (240)
Space heating - main system 2	0.0000	25.0500	0.0000 (241)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	430.2999	25.0500	107.7901 (247)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Energy for lighting	241.4504	25.0500	60.4833 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit	-456.0399	25.0500	-114.2380 (252)
Total energy cost			202.9396 (255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	594.4280	0.5190	308.5081 (261)
Space heating - main system 2	0.0000	0.5190	0.0000 (262)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	430.2999	0.5190	223.3256 (264)
Space and water heating			531.8337 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	241.4504	0.5190	125.3128 (268)
Energy saving/generation technologies			
PV Unit	-456.0399	0.5190	-236.6847 (269)
Total kg/year			420.4618 (272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	594.4280	3.0700	1824.8938 (261)
Space heating - main system 2	0.0000	3.0700	0.0000 (262)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	430.2999	3.0700	1321.0205 (264)
Space and water heating			3145.9144 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	241.4504	3.0700	741.2528 (268)
Energy saving/generation technologies			

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

PV Unit	-456.0399	3.0700	-1400.0425 (269)
Primary energy kwh/year			2487.1246 (272)
Primary energy kwh/m2/year			48.2937 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:	A 92
Current environmental impact rating:	A 93

(For testing purposes):

A	Not considered
B	Not considered
C	Not considered
D	Not considered
E Low energy lighting	Already installed
F	Not considered
G	Not considered
H	Not considered
I	Not considered
J	Not considered
K	Not considered
M	Not considered
N Solar water heating	Not applicable
O	Not considered
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U Solar photovoltaic panels	Not applicable
A2	Not considered
A3	Not considered
T2	Not considered
W	Not considered
X	Not considered
Y	Not considered
J2	Not considered
Q2	Not considered
Z1	Not considered
Z2	Not considered
Z3	Not considered
Z4	Not considered
Z5	Not considered
V2 Wind turbine	Not applicable
L2	Not considered
Q3	Not considered
O3	Not considered

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
	Total Savings £0		0.00 kg/m²

Potential energy efficiency rating:	A 92
Potential environmental impact rating:	A 93

Fuel prices for cost data on this page from database revision number 554 TEST (31 Oct 2024)
Recommendation texts revision number 4.9c (22 Feb 2014)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current £317	Potential £317	Saving £0
Electricity			
Space heating	£149	£149	£0
Water heating	£108	£108	£0
Lighting	£60	£60	£0
Generated (PV)	-£114	-£114	£0
Total cost of fuels	£203	£203	£0
Total cost of uses	£203	£203	£0
Delivered energy	16 kWh/m²	16 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.4 tonnes	0.4 tonnes	0.0 tonnes
CO2 emissions per m²	8 kg/m²	8 kg/m²	0 kg/m²
Primary energy	48 kWh/m²	48 kWh/m²	0 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	2455-06- Flat 10	Issued on Date	05/05/2025
Assessment Reference	010	Prop Type Ref	
Property			

SAP Rating	93 A	DER	12.71	TER	23.98
Environmental	94 A	% DER<TER	47.00		
CO ₂ Emissions (t/year)	0.36	DFEE	24.99	TFEE	33.42
General Requirements Compliance	Pass	% DFEE<TFEE	25.21		

Assessor Details	Mrs. Naomi Sadler, Sadler Energy & Environmental Services Ltd, Tel: 01962 718870, naomi.sadler@sadlerenergy.co.uk	Assessor ID	4611-0001
Client	RHB PARTNERSHIP LLP , RHB		

Calculation of Heat Demand 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
Calculation of Heat Demand 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	52.1000 (1b)	2.4000 (2b)	125.0400 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.1000		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 125.0400 (5)
Dwelling volume			

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour				
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000 (6a)				
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000 (6b)				
Number of intermittent fans							2 * 10 =	20.0000 (7a)				
Number of passive vents							0 * 10 =	0.0000 (7b)				
Number of flueless gas fires							0 * 40 =	0.0000 (7c)				
								Air changes per hour				
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						20.0000 / (5) =	0.1599 (8)				
Pressure test							Yes	4.0000				
Measured/design AP50								0.3599 (18)				
Infiltration rate								2 (19)				
Number of sides sheltered												
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.8500 (20)				
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.3060 (21)				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate	0.3213	0.3060	0.3060	0.2830	0.2830	0.2524	0.2601	0.2448	0.2524	0.2677	0.2677	0.2907 (22b)
Effective ac	0.5516	0.5468	0.5468	0.5400	0.5400	0.5319	0.5338	0.5300	0.5319	0.5358	0.5358	0.5422 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.9500	1.0000	1.9500		(26)					
Window (Uw = 1.20)			9.6800	1.1450	11.0840		(27)					
External Wall 1	18.0000	9.6800	8.3200	0.1800	1.4976		(29a)					
shelterd wall	14.4000	1.9500	12.4500	0.1671	2.0800		(29a)					
Total net area of external elements Aum(A, m2)			32.4000				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.6116		(33)					
Party Wall 1			33.1200	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							1.7664 (36)					
Total fabric heat loss						(33) + (36) =	18.3780 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 22.7609	Feb 22.5629	Mar 22.5629	Apr 22.2841	May 22.2841	Jun 21.9461	Jul 22.0270	Aug 21.8676	Sep 21.9461	Oct 22.1103	Nov 22.1103	Dec 22.3746 (38)
Heat transfer coeff	41.1389	40.9409	40.9409	40.6621	40.6621	40.3241	40.4050	40.2457	40.3241	40.4883	40.4883	40.7526 (39)
Average = Sum(39)m / 12 =												40.6144 (39)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF HEAT DEMAND 09 Jan 2014

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7896	0.7858	0.7858	0.7805	0.7805	0.7740	0.7755	0.7725	0.7740	0.7771	0.7771	0.7822 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kwh/year)

Assumed occupancy												1.7520 (42)
Average daily hot water use (litres/day)												75.8105 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	83.3915	80.3591	77.3267	74.2943	71.2619	68.2294	68.2294	71.2619	74.2943	77.3267	80.3591	83.3915 (44)
Energy content (annual)	123.6673	108.1602	111.6116	97.3057	93.3671	80.5687	74.6588	85.6720	86.6952	101.0349	110.2875	119.7651 (45)
Distribution loss (46)m = 0.15 x (45)m	18.5501	16.2240	16.7417	14.5959	14.0051	12.0853	11.1988	12.8508	13.0043	15.1552	16.5431	17.9648 (46)
Water storage loss:												
Store volume												201.0000 (47)
a) If manufacturer declared loss factor is known (kwh/day):												1.6100 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8694 (55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (57)
Primary 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 (59)
Total heat required for water heating calculated for each month	150.6187	132.5034	138.5630	123.3877	120.3185	106.6507	101.6102	112.6234	112.7772	127.9863	136.3695	146.7165 (62)
Solar input	0.0000	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	150.6187	132.5034	138.5630	123.3877	120.3185	106.6507	101.6102	112.6234	112.7772	127.9863	136.3695	146.7165 (64)
RHI water heating demand												1510.1253 (64)
Heat gains from water heating, kwh/month	41.1194	35.9633	37.1109	32.3541	31.0446	26.7891	24.8240	28.4860	28.8262	33.5941	36.6706	39.8219 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	105.1213	105.1213	105.1213	105.1213	105.1213	105.1213	105.1213	105.1213	105.1213	105.1213	105.1213	105.1213 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	34.5889	30.7216	24.9845	18.9149	14.1391	11.9368	12.8981	16.7655	22.5026	28.5722	33.3480	35.5503 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	227.8885	230.2533	224.2941	211.6078	195.5936	180.5425	170.4875	168.1227	174.0819	186.7682	202.7824	217.8335 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.2641	47.2641	47.2641	47.2641	47.2641	47.2641	47.2641	47.2641	47.2641	47.2641	47.2641	47.2641 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-70.0808	-70.0808	-70.0808	-70.0808	-70.0808	-70.0808	-70.0808	-70.0808	-70.0808	-70.0808	-70.0808	-70.0808 (71)
Water heating gains (Table 5)	55.2680	53.5168	49.8802	44.9363	41.7266	37.2071	33.3657	38.2876	40.0363	45.1534	50.9314	53.5241 (72)
Total internal gains	400.0500	396.7962	381.4634	357.7636	333.7638	311.9910	299.0559	305.4804	318.9254	342.7984	369.3663	389.2124 (73)

6. Solar gains

[Jan]												
	Area	Solar flux	Specific data	Specific data	FF	Access	Gains					
	m2	Table 6a	or Table 6b	or Table 6c		factor	W					
		W/m2				Table 6d						
West	9.6800	22.3313	0.6300	0.7000	0.7700	66.0635 (80)						
Solar gains	66.0635	116.2483	188.7667	282.9071	337.0958	369.0130	347.6251	305.8277	237.7086	147.2013	84.3880	53.8003 (83)
Total gains	466.1135	513.0444	570.2300	640.6707	670.8596	681.0040	646.6810	611.3081	556.6340	489.9996	453.7544	443.0126 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nll,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	87.9473	88.3726	88.3726	88.9786	88.9786	89.7244	89.5448	89.8993	89.7244	89.3606	89.3606	88.7809
alpha	6.8632	6.8915	6.8915	6.9319	6.9319	6.9816	6.9697	6.9933	6.9816	6.9574	6.9574	6.9187
util living area	0.9698	0.9440	0.8626	0.6849	0.4832	0.2960	0.1937	0.2107	0.4196	0.7422	0.9291	0.9760 (86)
MIT	20.6102	20.7178	20.8747	20.9758	20.9978	20.9999	21.0000	21.0000	20.9994	20.9673	20.7974	20.5835 (87)
Th 2	20.2623	20.2656	20.2656	20.2703	20.2703	20.2759	20.2746	20.2773	20.2759	20.2732	20.2732	20.2688 (88)
util rest of house	0.9619	0.9308	0.8361	0.6453	0.4398	0.2532	0.1484	0.1631	0.3675	0.6951	0.9103	0.9696 (89)
MIT 2	19.7667	19.9181	20.1243	20.2470	20.2687	20.2759	20.2746	20.2773	20.2756	20.2433	20.0357	19.7350 (90)
Living area fraction	20.2054	20.3340	20.5146	20.6261	20.6480	20.6525	20.6519	20.6532	20.6521	20.6199	20.4319	20.1763 (92)
Temperature adjustment	20.2054	20.3340	20.5146	20.6261	20.6480	20.6525	20.6519	20.6532	20.6521	20.6199	20.4319	20.1763 (93)
adjusted MIT	20.2054	20.3340	20.5146	20.6261	20.6480	20.6525	20.6519	20.6532	20.6521	20.6199	20.4319	20.1763 (93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF HEAT DEMAND 09 Jan 2014

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9612	0.9321	0.8455	0.6649	0.4624	0.2755	0.1719	0.1878	0.3946	0.7181	0.9148	0.9686 (94)
Useful gains	448.0448	478.2114	482.1373	425.9781	310.1720	187.5921	111.1906	114.8278	219.6473	351.8846	415.0920	429.1095 (95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Heat loss rate W	621.4213	603.2256	536.9256	436.1441	310.9824	187.6089	111.1911	114.8286	219.8503	365.2003	503.3460	614.4007 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	128.9921	84.0095	40.7625	7.3195	0.6029	0.0000	0.0000	0.0000	0.0000	9.9069	63.5429	137.8567 (98)
Space heating												472.9931 (98)
RHI space heating demand												473 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	52.1000 (1b)	x 2.4000 (2b)	= 125.0400 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.1000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 125.0400 (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) = 0.1599 (8)
Pressure test					Yes
Measured/design AP50					4.0000
Infiltration rate					0.3599 (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) =				0.3060 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infiltr rate	0.3901	0.3824	0.3748	0.3366	0.3289	0.2907	0.2907	0.2830	0.3060	0.3289	0.3442	0.3595 (22b)
Effective ac	0.5761	0.5731	0.5702	0.5566	0.5541	0.5422	0.5422	0.5400	0.5468	0.5541	0.5592	0.5646 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.9500	1.0000	1.9500		(26)					
Window (Uw = 1.20)			9.6800	1.1450	11.0840		(27)					
External Wall 1	18.0000	9.6800	8.3200	0.1800	1.4976		(29a)					
shelterd wall	14.4000	1.9500	12.4500	0.1671	2.0800		(29a)					
Total net area of external elements Aum(A, m2)			32.4000				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =			16.6116	(33)					
Party Wall 1			33.1200	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								1.7664 (36)				
Total fabric heat loss								(33) + (36) = 18.3780 (37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	23.7712	23.6493	23.5298	22.9685	22.8635	22.3746	22.3746	22.2841	22.5629	22.8635	23.0759	23.2980 (38)
Average = Sum(39)m / 12 =	42.1492	42.0273	41.9078	41.3465	41.2415	40.7526	40.7526	40.6621	40.9409	41.2415	41.4539	41.6760 (39)
												41.3460 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8090	0.8067	0.8044	0.7936	0.7916	0.7822	0.7822	0.7805	0.7858	0.7916	0.7957	0.7999 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.7520 (42)
Average daily hot water use (litres/day)													75.8105 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	83.3915	80.3591	77.3267	74.2943	71.2619	68.2294	68.2294	71.2619	74.2943	77.3267	80.3591	83.3915 (44)	
Energy content (annual)	123.6673	108.1602	111.6116	97.3057	93.3671	80.5687	74.6588	85.6720	86.6952	101.0349	110.2875	119.7651 (45)	
Distribution loss (46)m = 0.15 x (45)m	Total = Sum(45)m = 1192.7943 (45)												
Water storage loss:	18.5501	16.2240	16.7417	14.5959	14.0051	12.0853	11.1988	12.8508	13.0043	15.1552	16.5431	17.9648 (46)	
Store volume													201.0000 (47)
a) If manufacturer declared loss factor is known (kwh/day):													1.6100 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.8694 (55)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (57)
Primary 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 (59)
Total heat required for water heating calculated for each month	150.6187	132.5034	138.5630	123.3877	120.3185	106.6507	101.6102	112.6234	112.7772	127.9863	136.3695	146.7165 (62)
Solar input	0.0000	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	150.6187	132.5034	138.5630	123.3877	120.3185	106.6507	101.6102	112.6234	112.7772	127.9863	136.3695	146.7165 (64)
Heat gains from water heating, kWh/month	41.1194	35.9633	37.1109	32.3541	31.0446	26.7891	24.8240	28.4860	28.8262	33.5941	36.6706	39.8219 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	105.1213	105.1213	105.1213	105.1213	105.1213	105.1213	105.1213	105.1213	105.1213	105.1213	105.1213	105.1213 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	34.5889	30.7216	24.9845	18.9149	14.1391	11.9368	12.8981	16.7655	22.5026	28.5722	33.3480	35.5503 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	227.8885	230.2533	224.2941	211.6078	195.5936	180.5425	170.4875	168.1227	174.0819	186.7682	202.7824	217.8335 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.2641	47.2641	47.2641	47.2641	47.2641	47.2641	47.2641	47.2641	47.2641	47.2641	47.2641	47.2641 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-70.0808	-70.0808	-70.0808	-70.0808	-70.0808	-70.0808	-70.0808	-70.0808	-70.0808	-70.0808	-70.0808	-70.0808 (71)
Water heating gains (Table 5)	55.2680	53.5168	49.8802	44.9363	41.7266	37.2071	33.3657	38.2876	40.0363	45.1534	50.9314	53.5241 (72)
Total internal gains	400.0500	396.7962	381.4634	357.7636	333.7638	311.9910	299.0559	305.4804	318.9254	342.7984	369.3663	389.2124 (73)

6. Solar gains

[Jan]	Area m2		Solar flux Table 6a W/m2		Specific data or Table 6b		Specific data or Table 6c		Access factor Table 6d		Gains W	
West	9.6800		19.6403		0.6300		0.7000		0.7700		58.1025 (80)	
Solar gains	58.1025	113.6607	187.1830	272.9953	334.5660	342.4878	326.0624	280.0828	217.7016	134.8680	72.4469	47.7806 (83)
Total gains	458.1524	510.4569	568.6464	630.7588	668.3298	654.4788	625.1182	585.5631	536.6270	477.6664	441.8133	436.9930 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, n1,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	85.8392	86.0882	86.3337	87.5057	87.7285	88.7809	88.7809	88.9786	88.3726	87.7285	87.2789	86.8138
alpha	6.7226	6.7392	6.7556	6.8337	6.8486	6.9187	6.9187	6.9319	6.8915	6.8486	6.8186	6.7876
util living area	0.9798	0.9586	0.8981	0.7529	0.5684	0.3981	0.2868	0.3193	0.5234	0.8211	0.9564	0.9843 (86)
MIT	20.5099	20.6398	20.8134	20.9511	20.9929	20.9995	21.0000	20.9999	20.9969	20.9292	20.7039	20.4801 (87)
Th 2	20.2455	20.2476	20.2495	20.2589	20.2606	20.2688	20.2688	20.2703	20.2656	20.2606	20.2571	20.2534 (88)
util rest of house	0.9745	0.9485	0.8767	0.7164	0.5251	0.3528	0.2392	0.2687	0.4690	0.7815	0.9441	0.9800 (89)
MIT 2	19.6104	19.7945	20.0307	20.2088	20.2546	20.2685	20.2688	20.2703	20.2635	20.1896	19.8949	19.5744 (90)
Living area fraction	0.0745	0.0745	0.0745	0.0745	0.0745	0.0745	0.0745	0.0745	0.0745	0.0745	0.0745	0.0745 (91)
MIT	20.0783	20.2342	20.4379	20.5949	20.6386	20.6487	20.6491	20.6498	20.6450	20.5743	20.3157	20.0455 (92)
Temperature adjustment	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (93)
adjusted MIT	20.0783	20.2342	20.4379	20.5949	20.6386	20.6487	20.6491	20.6498	20.6450	20.5743	20.3157	20.0455 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9731	0.9483	0.8824	0.7334	0.5473	0.3764	0.2639	0.2951	0.4972	0.7990	0.9451	0.9786 (94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	17.7796	26.8337	381.6425	417.5790	427.6520 (95)
Heat loss rate w	665.0411	644.4541	584.1051	483.5432	368.6429	246.5007	165.0114	172.8054	267.9581	411.3559	547.8438	660.3772 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	163.1009	107.7933	61.2388	15.0968	2.1105	0.0000	0.0000	0.0000	0.0000	22.1068	93.7906	173.1475 (98)
Space heating												638.3851 (98)
Space heating per m2										(98) / (4) =		12.2531 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 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)
Fraction of main heating from main system 2													0.0000 (203)
Fraction of total heating from main system 1													1.0000 (204)
Fraction of total heating from main system 2													0.0000 (205)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													638.3851 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	163.1009	107.7933	61.2388	15.0968	2.1105	0.0000	0.0000	0.0000	0.0000	22.1068	93.7906	173.1475	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	163.1009	107.7933	61.2388	15.0968	2.1105	0.0000	0.0000	0.0000	0.0000	22.1068	93.7906	173.1475	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Water heating requirement	150.6187	132.5034	138.5630	123.3877	120.3185	106.6507	101.6102	112.6234	112.7772	127.9863	136.3695	146.7165	(64)
Efficiency of water heater (217)m	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	(216)
Fuel for water heating, kWh/month	43.1066	37.9220	39.6563	35.3132	34.4348	30.5231	29.0805	32.2325	32.2765	36.6293	39.0285	41.9898	(219)
Water heating fuel used												432.1929	(219)
Annual totals kWh/year													
Space heating fuel - main system												638.3851	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												244.3406	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.50 * 1000 * 1.00) =												-431.8098	
Total delivered energy for all uses												-431.8098	(233)
												883.1088	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	638.3851	13.1900	84.2030 (240)
Space heating - main system 2	0.0000	13.1900	0.0000 (241)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	432.1929	13.1900	57.0062 (247)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Energy for lighting	244.3406	13.1900	32.2285 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit	-431.8098	13.1900	-56.9557 (252)
Total energy cost			116.4821 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.5038 (257)
SAP value		92.9715
SAP rating (Section 12)		93 (258)
SAP band		A

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	638.3851	0.5190	331.3219 (261)
Space heating - main system 2	0.0000	0.5190	0.0000 (262)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	432.1929	0.5190	224.3081 (264)
Space and water heating			555.6300 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	244.3406	0.5190	126.8128 (268)
Energy saving/generation technologies			
PV Unit	-431.8098	0.5190	-224.1093 (269)
Total kg/year			458.3335 (272)
CO2 emissions per m2			8.8000 (273)
EI value			93.6749
EI rating			94 (274)
EI band			A

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

Calculation of stars for heating and DHW

Main heating 1 energy efficiency	$13.19 \times (1 + 0.29 \times 0.00) / 1.0000 = 13.190$, stars = 1
Main heating 2 energy efficiency	(does water heating only)
Main heating 1 environmental impact	$0.519 \times (1 + 0.29 \times 0.00) / 1.0000 = 0.5190$, stars = 2
Main heating 2 environmental impact	(does water heating only)
Water heating energy efficiency	$13.19 / 3.4941 = 3.775$, stars = 5
Water heating environmental impact	$0.519 / 3.4941 = 0.1485$, stars = 5

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	52.1000 (1b)	x 2.4000 (2b)	= 125.0400 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.1000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	125.0400 (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) =	0.1599 (8)
Pressure test				Yes	
Measured/design AP50				4.0000	
Infiltration rate				0.3599 (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) =	0.3060 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infiltr rate	0.3213	0.3060	0.3060	0.2830	0.2830	0.2524	0.2601	0.2448	0.2524	0.2677	0.2677	0.2907 (22b)
Effective ac	0.5516	0.5468	0.5468	0.5400	0.5400	0.5319	0.5338	0.5300	0.5319	0.5358	0.5358	0.5422 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.9500	1.0000	1.9500		(26)					
Window (Uw = 1.20)			9.6800	1.1450	11.0840		(27)					
External Wall 1	18.0000	9.6800	8.3200	0.1800	1.4976		(29a)					
shelterd wall	14.4000	1.9500	12.4500	0.1671	2.0800		(29a)					
Total net area of external elements Aum(A, m2)			32.4000				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	16.6116			(33)					
Party Wall 1			33.1200	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								1.7664 (36)				
Total fabric heat loss								(33) + (36) = 18.3780 (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	22.7609	22.5629	22.5629	22.2841	22.2841	21.9461	22.0270	21.8676	21.9461	22.1103	22.1103	22.3746 (38)
Heat transfer coeff	41.1389	40.9409	40.9409	40.6621	40.6621	40.3241	40.4050	40.2457	40.3241	40.4883	40.4883	40.7526 (39)
Average = Sum(39)m / 12 =												40.6144 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.7896	0.7858	0.7858	0.7805	0.7805	0.7740	0.7755	0.7725	0.7740	0.7771	0.7771	0.7822 (40)
HLP (average)												0.7795 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7520 (42)
Average daily hot water use (litres/day)												75.8105 (43)
Daily hot water use	83.3915	80.3591	77.3267	74.2943	71.2619	68.2294	68.2294	71.2619	74.2943	77.3267	80.3591	83.3915 (44)
Energy conte	123.6673	108.1602	111.6116	97.3057	93.3671	80.5687	74.6588	85.6720	86.6952	101.0349	110.2875	119.7651 (45)
Energy content (annual)												Total = Sum(45)m = 1192.7943 (45)
Distribution loss (46)m = 0.15 x (45)m	18.5501	16.2240	16.7417	14.5959	14.0051	12.0853	11.1988	12.8508	13.0043	15.1552	16.5431	17.9648 (46)
Water storage loss:												
Store volume												201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8694 (55)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (57)
Primary 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 (59)
Total heat required for water heating calculated for each month	150.6187	132.5034	138.5630	123.3877	120.3185	106.6507	101.6102	112.6234	112.7772	127.9863	136.3695	146.7165 (62)
Solar input	0.0000	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	150.6187	132.5034	138.5630	123.3877	120.3185	106.6507	101.6102	112.6234	112.7772	127.9863	136.3695	146.7165 (64)
Heat gains from water heating, kWh/month	41.1194	35.9633	37.1109	32.3541	31.0446	26.7891	24.8240	28.4860	28.8262	33.5941	36.6706	39.8219 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	105.1213	105.1213	105.1213	105.1213	105.1213	105.1213	105.1213	105.1213	105.1213	105.1213	105.1213	105.1213 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	34.5889	30.7216	24.9845	18.9149	14.1391	11.9368	12.8981	16.7655	22.5026	28.5722	33.3480	35.5503 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	227.8885	230.2533	224.2941	211.6078	195.5936	180.5425	170.4875	168.1227	174.0819	186.7682	202.7824	217.8335 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.2641	47.2641	47.2641	47.2641	47.2641	47.2641	47.2641	47.2641	47.2641	47.2641	47.2641	47.2641 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-70.0808	-70.0808	-70.0808	-70.0808	-70.0808	-70.0808	-70.0808	-70.0808	-70.0808	-70.0808	-70.0808	-70.0808 (71)
Water heating gains (Table 5)	55.2680	53.5168	49.8802	44.9363	41.7266	37.2071	33.3657	38.2876	40.0363	45.1534	50.9314	53.5241 (72)
Total internal gains	400.0500	396.7962	381.4634	357.7636	333.7638	311.9910	299.0559	305.4804	318.9254	342.7984	369.3663	389.2124 (73)

6. Solar gains

[Jan]	Area m2				Solar Flux Table 6a W/m2		Specific data or Table 6b		Specific data or Table 6c		Access factor Table 6d		Gains W	
West	9.6800				22.3313		0.6300		0.7000		0.7700		66.0635 (80)	
Solar gains	66.0635	116.2483	188.7667	282.9071	337.0958	369.0130	347.6251	305.8277	237.7086	147.2013	84.3880	53.8003	(83)	
Total gains	466.1135	513.0444	570.2300	640.6707	670.8596	681.0040	646.6810	611.3081	556.6340	489.9996	453.7544	443.0126	(84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000 (85)											
Utilisation factor for gains for living area, n1,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	87.9473	88.3726	88.3726	88.9786	88.9786	89.7244	89.5448	89.8993	89.7244	89.3606	89.3606	88.7809
alpha	6.8632	6.8915	6.8915	6.9319	6.9319	6.9816	6.9697	6.9933	6.9816	6.9574	6.9574	6.9187
util living area	0.9698	0.9440	0.8626	0.6849	0.4832	0.2960	0.1937	0.2107	0.4196	0.7422	0.9291	0.9760 (86)
MIT	20.6102	20.7178	20.8747	20.9758	20.9978	20.9999	21.0000	21.0000	20.9994	20.9673	20.7974	20.5835 (87)
Th 2	20.2623	20.2656	20.2656	20.2703	20.2703	20.2759	20.2746	20.2773	20.2759	20.2732	20.2732	20.2688 (88)
util rest of house	0.9619	0.9308	0.8361	0.6453	0.4398	0.2532	0.1484	0.1631	0.3675	0.6951	0.9103	0.9696 (89)
MIT 2	19.7667	19.9181	20.1243	20.2470	20.2687	20.2759	20.2746	20.2773	20.2756	20.2433	20.0357	19.7350 (90)
Living area fraction	20.2054	20.3340	20.5146	20.6261	20.6480	20.6525	20.6519	20.6532	20.6521	20.6199	20.4319	20.1763 (92)
MIT	20.2054	20.3340	20.5146	20.6261	20.6480	20.6525	20.6519	20.6532	20.6521	20.6199	20.4319	20.1763 (93)
Temperature adjustment	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
adjusted MIT	20.2054	20.3340	20.5146	20.6261	20.6480	20.6525	20.6519	20.6532	20.6521	20.6199	20.4319	20.1763 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9612	0.9321	0.8455	0.6649	0.4624	0.2755	0.1719	0.1878	0.3946	0.7181	0.9148	0.9686 (94)
Ext temp.	448.0448	478.2114	482.1373	425.9781	310.1720	187.5921	111.1906	114.8278	219.6473	351.8846	415.0920	429.1095 (95)
Heat loss rate w	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Month fracti	621.4213	603.2256	536.9256	436.1441	310.9824	187.6089	111.1911	114.8286	219.8503	365.2003	503.3460	614.4007 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating	128.9921	84.0095	40.7625	7.3195	0.6029	0.0000	0.0000	0.0000	0.0000	9.9069	63.5429	137.8567 (98)
Space heating per m2										(98) / (4) =		9.0786 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 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)
Fraction of main heating from main system 2													0.0000 (203)
Fraction of total heating from main system 1													1.0000 (204)
Fraction of total heating from main system 2													0.0000 (205)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													472.9931 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	128.9921	84.0095	40.7625	7.3195	0.6029	0.0000	0.0000	0.0000	0.0000	9.9069	63.5429	137.8567	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	128.9921	84.0095	40.7625	7.3195	0.6029	0.0000	0.0000	0.0000	0.0000	9.9069	63.5429	137.8567	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Water heating requirement	150.6187	132.5034	138.5630	123.3877	120.3185	106.6507	101.6102	112.6234	112.7772	127.9863	136.3695	146.7165	(64)
Efficiency of water heater (217)m	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	(216)
Fuel for water heating, kWh/month	43.1066	37.9220	39.6563	35.3132	34.4348	30.5231	29.0805	32.2325	32.2765	36.6293	39.0285	41.9898	(219)
Water heating fuel used												432.1929	(219)
Annual totals kWh/year													
Space heating fuel - main system												472.9931	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												244.3406	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.50 * 1140 * 1.00) =										-456.0399		-456.0399	(233)
Total delivered energy for all uses												693.4867	(238)

10a. Fuel costs - using BEDF prices (554)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	472.9931	25.0500	118.4848 (240)
Space heating - main system 2	0.0000	25.0500	0.0000 (241)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	432.1929	25.0500	108.2643 (247)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Energy for lighting	244.3406	25.0500	61.2073 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit	-456.0399	25.0500	-114.2380 (252)
Total energy cost			173.7184 (255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	472.9931	0.5190	245.4834 (261)
Space heating - main system 2	0.0000	0.5190	0.0000 (262)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	432.1929	0.5190	224.3081 (264)
Space and water heating			469.7915 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	244.3406	0.5190	126.8128 (268)
Energy saving/generation technologies			
PV Unit	-456.0399	0.5190	-236.6847 (269)
Total kg/year			359.9196 (272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	472.9931	3.0700	1452.0887 (261)
Space heating - main system 2	0.0000	3.0700	0.0000 (262)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	432.1929	3.0700	1326.8323 (264)
Space and water heating			2778.9210 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	244.3406	3.0700	750.1257 (268)
Energy saving/generation technologies			

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

PV Unit	-456.0399	3.0700	-1400.0425 (269)
Primary energy kwh/year			2129.0041 (272)
Primary energy kwh/m2/year			40.8638 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:	A 93
Current environmental impact rating:	A 94

(For testing purposes):

A	Not considered
B	Not considered
C	Not considered
D	Not considered
E Low energy lighting	Already installed
F	Not considered
G	Not considered
H	Not considered
I	Not considered
J	Not considered
K	Not considered
M	Not considered
N Solar water heating	Not applicable
O	Not considered
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U Solar photovoltaic panels	Not applicable
A2	Not considered
A3	Not considered
T2	Not considered
W	Not considered
X	Not considered
Y	Not considered
J2	Not considered
Q2	Not considered
Z1	Not considered
Z2	Not considered
Z3	Not considered
Z4	Not considered
Z5	Not considered
V2 Wind turbine	Not applicable
L2	Not considered
Q3	Not considered
O3	Not considered

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
	Total Savings £0		0.00 kg/m²

Potential energy efficiency rating:	A 93
Potential environmental impact rating:	A 94

Fuel prices for cost data on this page from database revision number 554 TEST (31 Oct 2024)
Recommendation texts revision number 4.9c (22 Feb 2014)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current £288	Potential £288	Saving £0
Electricity			
Space heating	£118	£118	£0
Water heating	£108	£108	£0
Lighting	£61	£61	£0
Generated (PV)	-£114	-£114	£0
Total cost of fuels	£174	£174	£0
Total cost of uses	£173	£173	£0
Delivered energy	13 kWh/m²	13 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.4 tonnes	0.4 tonnes	0.0 tonnes
CO2 emissions per m²	7 kg/m²	7 kg/m²	0 kg/m²
Primary energy	41 kWh/m²	41 kWh/m²	0 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	2455-06-Flat 11	Issued on Date	05/05/2025
Assessment Reference	011	Prop Type Ref	
Property			

SAP Rating	89 B	DER	17.24	TER	27.70
Environmental	90 B	% DER<TER	37.77		
CO ₂ Emissions (t/year)	0.71	DFEE	33.37	TFEE	51.49
General Requirements Compliance	Pass	% DFEE<TFEE	35.18		

Assessor Details	Mrs. Naomi Sadler, Sadler Energy & Environmental Services Ltd, Tel: 01962 718870, naomi.sadler@sadlerenergy.co.uk	Assessor ID	4611-0001
Client	RHB PARTNERSHIP LLP , RHB		

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	65.4000 (1b)	2.4000 (2b)	156.9600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.4000		
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 156.9600 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				1 * 10 =	10.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				10.0000 / (5) =	0.0637 (8)
Pressure test				Yes	
Measured/design AP50				4.0000	
Infiltration rate				0.2637 (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) =	0.2242 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate	0.2354	0.2242	0.2242	0.2073	0.2073	0.1849	0.1905	0.1793	0.1849	0.1961	0.1961	0.2129 (22b)
Effective ac	0.5277	0.5251	0.5251	0.5215	0.5215	0.5171	0.5182	0.5161	0.5171	0.5192	0.5192	0.5227 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.9500	1.0000	1.9500		(26)
Window (Uw = 1.20)			11.2100	1.1450	12.8359		(27)
Heat Loss Floor 1			65.4000	0.1065	6.9642		(28b)
External Wall 1	42.9600	11.2100	31.7500	0.1800	5.7150		(29a)
shelterd wall	18.0000	1.9500	16.0500	0.1671	2.6815		(29a)
Total net area of external elements Aum(A, m ²)			126.3600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.1465		(33)
Party Wall 1			20.6400	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							1.9737 (36)
Total fabric heat loss						(33) + (36) =	32.1202 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	27.3330	27.1997	27.1997	27.0118	27.0118	26.7841	26.8386	26.7312	26.7841	26.8947	26.8947	27.0728 (38)
Average = Sum(39)m / 12 =	59.4533	59.3199	59.3199	59.1320	59.1320	58.9043	58.9588	58.8514	58.9043	59.0149	59.0149	59.1930 (39)
												59.0999 (39)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF HEAT DEMAND 09 Jan 2014

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9091	0.9070	0.9070	0.9042	0.9042	0.9007	0.9015	0.8999	0.9007	0.9024	0.9024	0.9051 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kwh/year)

Assumed occupancy	2.1295 (42)
Average daily hot water use (litres/day)	84.7756 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	93.2531	89.8621	86.4711	83.0801	79.6890	76.2980	76.2980	79.6890	83.0801	86.4711	89.8621	93.2531 (44)
Energy content (annual)	138.2917	120.9508	124.8104	108.8127	104.4084	90.0965	83.4877	95.8033	96.9475	112.9830	123.3298	133.9281 (45)
Distribution loss (46)m = 0.15 x (45)m	20.7438	18.1426	18.7216	16.3219	15.6613	13.5145	12.5231	14.3705	14.5421	16.9474	18.4995	20.0892 (46)
Water storage loss:												
Store volume												201.0000 (47)
a) If manufacturer declared loss factor is known (kwh/day):												1.6100 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8694 (55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (57)
Primary 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 (59)
Total heat required for water heating calculated for each month	165.2431	145.2940	151.7618	134.8947	131.3598	116.1785	110.4391	122.7547	123.0295	139.9344	149.4118	160.8795 (62)
Solar input	0.0000	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	165.2431	145.2940	151.7618	134.8947	131.3598	116.1785	110.4391	122.7547	123.0295	139.9344	149.4118	160.8795 (64)
RHI water heating demand												1651.1809 (64)
Heat gains from water heating, kWh/month	45.9820	40.2161	41.4995	36.1802	34.7158	29.9571	27.7596	31.8546	32.2350	37.5668	41.0071	44.5311 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	127.7699	127.7699	127.7699	127.7699	127.7699	127.7699	127.7699	127.7699	127.7699	127.7699	127.7699	127.7699 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	42.7686	37.9867	30.8928	23.3879	17.4827	14.7596	15.9483	20.7302	27.8240	35.3290	41.2342	43.9572 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	278.1083	280.9942	273.7218	258.2398	238.6966	220.3287	208.0578	205.1719	212.4443	227.9263	247.4695	265.8374 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.9065	49.9065	49.9065	49.9065	49.9065	49.9065	49.9065	49.9065	49.9065	49.9065	49.9065	49.9065 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-85.1799	-85.1799	-85.1799	-85.1799	-85.1799	-85.1799	-85.1799	-85.1799	-85.1799	-85.1799	-85.1799	-85.1799 (71)
Water heating gains (Table 5)	61.8038	59.8455	55.7788	50.2503	46.6610	41.6071	37.3114	42.8153	44.7709	50.4931	56.9544	59.8536 (72)
Total internal gains	475.1770	471.3227	452.8899	424.3744	395.3367	369.1918	353.8139	361.2139	377.5357	406.2448	438.1545	462.1447 (73)

6. Solar gains

[Jan]												
	Area	Solar flux	g	FF	Access	Gains						
	m2	Table 6a	Specific data	Specific data	factor	W						
		W/m2	or Table 6b	or Table 6c	Table 6d							
East	1.5300	22.3313	0.6300	0.7000	0.7700	10.4419 (76)						
West	9.6800	22.3313	0.6300	0.7000	0.7700	66.0635 (80)						
Solar gains	76.5053	134.6222	218.6027	327.6228	390.3764	427.3384	402.5700	354.1662	275.2803	170.4676	97.7262	62.3038 (83)
Total gains	551.6824	605.9449	671.4926	751.9972	785.7131	796.5302	756.3839	715.3801	652.8160	576.7124	535.8807	524.4485 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, n11,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	76.3905	76.5623	76.5623	76.8056	76.8056	77.1025	77.0312	77.1717	77.1025	76.9580	76.9580	76.7264
alpha	6.0927	6.1042	6.1042	6.1204	6.1204	6.1402	6.1354	6.1448	6.1402	6.1305	6.1305	6.1151
util living area	0.9840	0.9710	0.9249	0.7950	0.5910	0.3692	0.2416	0.2632	0.5186	0.8425	0.9638	0.9874 (86)
MIT	20.3955	20.5114	20.7210	20.9120	20.9870	20.9994	21.0000	20.9999	20.9954	20.8965	20.6230	20.3637 (87)
Th 2	20.1598	20.1615	20.1615	20.1640	20.1640	20.1669	20.1662	20.1676	20.1669	20.1655	20.1655	20.1632 (88)
util rest of house	0.9792	0.9627	0.9052	0.7535	0.5334	0.3080	0.1766	0.1948	0.4464	0.7973	0.9518	0.9836 (89)
MIT 2	19.3786	19.5444	19.8332	20.0752	20.1540	20.1667	20.1662	20.1676	20.1643	20.0649	19.7076	19.3359 (90)
Living area fraction	19.8575	19.9998	20.2513	20.4693	20.5463	20.5588	20.5589	20.5596	20.5557	20.4565	20.1387	19.8199 (92)
MIT												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF HEAT DEMAND 09 Jan 2014

Temperature adjustment												0.0000
adjusted MIT	19.8575	19.9998	20.2513	20.4693	20.5463	20.5588	20.5589	20.5596	20.5557	20.4565	20.1387	19.8199 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9772	0.9609	0.9075	0.7693	0.5601	0.3368	0.2072	0.2270	0.4804	0.8141	0.9514	0.9816 (94)
Useful gains	539.0899	582.2244	609.4026	578.5171	440.0751	268.3098	156.7555	162.3920	313.5885	469.5279	509.8121	514.8244 (95)
Ext temp.	5.1000	5.6000	7.4000	9.0000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Heat loss rate w	877.3832	854.1945	762.3399	624.9848	446.2283	268.5342	156.7635	162.4058	315.4741	522.6670	716.3625	871.3170 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	251.6903	182.7639	113.7854	33.4567	4.5779	0.0000	0.0000	0.0000	0.0000	39.5355	148.7163	265.2305 (98)
Space heating												1039.7565 (98)
RHI space heating demand												1040 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	65.4000 (1b)	x 2.4000 (2b)	= 156.9600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.4000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 156.9600 (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				1 * 10 =	10.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				10.0000 / (5) = 0.0637 (8)
Pressure test					Yes
Measured/design AP50					4.0000
Infiltration rate					0.2637 (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) =				0.2242 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infiltr rate	0.2850	0.2802	0.2746	0.2466	0.2410	0.2129	0.2129	0.2073	0.2242	0.2410	0.2522	0.2634 (22b)
Effective ac	0.5408	0.5393	0.5377	0.5304	0.5290	0.5227	0.5227	0.5215	0.5251	0.5290	0.5318	0.5347 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.9500	1.0000	1.9500		(26)					
Window (Uw = 1.20)			11.2100	1.1450	12.8359		(27)					
Heat Loss Floor 1			65.4000	0.1065	6.9642		(28b)					
External Wall 1	42.9600	11.2100	31.7500	0.1800	5.7150		(29a)					
shelterd wall	18.0000	1.9500	16.0500	0.1671	2.6815		(29a)					
Total net area of external elements Aum(A, m2)			126.3600				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.1465		(33)					
Party Wall 1			20.6400	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							1.9737 (36)					
Total fabric heat loss						(33) + (36) =	32.1202 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 28.0138	Feb 27.9316	Mar 27.8511	Apr 27.4729	May 27.4022	Jun 27.0728	Jul 27.0728	Aug 27.0118	Sep 27.1997	Oct 27.4022	Nov 27.5453	Dec 27.6950 (38)
Heat transfer coeff	60.1340	60.0518	59.9713	59.5931	59.5224	59.1930	59.1930	59.1320	59.3199	59.5224	59.6655	59.8152 (39)
Average = Sum(39)m / 12 =												59.5928 (39)
HLP	Jan 0.9195	Feb 0.9182	Mar 0.9170	Apr 0.9112	May 0.9101	Jun 0.9051	Jul 0.9051	Aug 0.9042	Sep 0.9070	Oct 0.9101	Nov 0.9123	Dec 0.9146 (40)
HLP (average)												0.9112 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1295 (42)
Average daily hot water use (litres/day)												84.7756 (43)
Daily hot water use	Jan 93.2531	Feb 89.8621	Mar 86.4711	Apr 83.0801	May 79.6890	Jun 76.2980	Jul 76.2980	Aug 79.6890	Sep 83.0801	Oct 86.4711	Nov 89.8621	Dec 93.2531 (44)
Energy conte	138.2917	120.9508	124.8104	108.8127	104.4084	90.0965	83.4877	95.8033	96.9475	112.9830	123.3298	133.9281 (45)
Energy content (annual)												Total = Sum(45)m = 1333.8499 (45)
Distribution loss (46)m = 0.15 x (45)m	20.7438	18.1426	18.7216	16.3219	15.6613	13.5145	12.5231	14.3705	14.5421	16.9474	18.4995	20.0892 (46)
Water storage loss:												201.0000 (47)
Store volume												1.6100 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

Enter (49) or (54) in (55)												0.8694 (55)	
Total storage loss													
26.9514 24.3432 26.9514 26.0820 26.9514 26.0820 26.9514 26.9514 26.0820 26.9514 26.0820 26.9514 (56)													
If cylinder contains dedicated solar storage													
26.9514 24.3432 26.9514 26.0820 26.9514 26.0820 26.9514 26.9514 26.0820 26.9514 26.0820 26.9514 (57)													
Primary 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 (59)													
Total heat required for water heating calculated for each month													
165.2431 145.2940 151.7618 134.8947 131.3598 116.1785 110.4391 122.7547 123.0295 139.9344 149.4118 160.8795 (62)													
Solar input 0.0000 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													
165.2431 145.2940 151.7618 134.8947 131.3598 116.1785 110.4391 122.7547 123.0295 139.9344 149.4118 160.8795 (64)													
Heat gains from water heating, kWh/month													
45.9820 40.2161 41.4995 36.1802 34.7158 29.9571 27.7596 31.8546 32.2350 37.5668 41.0071 44.5311 (65)													

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	127.7699	127.7699	127.7699	127.7699	127.7699	127.7699	127.7699	127.7699	127.7699	127.7699	127.7699	127.7699 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	42.7686	37.9867	30.8928	23.3879	17.4827	14.7596	15.9483	20.7302	27.8240	35.3290	41.2342	43.9572 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	278.1083	280.9942	273.7218	258.2398	238.6966	220.3287	208.0578	205.1719	212.4443	227.9263	247.4695	265.8374 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.9065	49.9065	49.9065	49.9065	49.9065	49.9065	49.9065	49.9065	49.9065	49.9065	49.9065	49.9065 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-85.1799	-85.1799	-85.1799	-85.1799	-85.1799	-85.1799	-85.1799	-85.1799	-85.1799	-85.1799	-85.1799	-85.1799 (71)
Water heating gains (Table 5)	61.8038	59.8455	55.7788	50.2503	46.6610	41.6071	37.3114	42.8153	44.7709	50.4931	56.9544	59.8536 (72)
Total internal gains	475.1770	471.3227	452.8899	424.3744	395.3367	369.1918	353.8139	361.2139	377.5357	406.2448	438.1545	462.1447 (73)

6. Solar gains

[Jan]						Area m2	Solar Flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East						1.5300	19.6403	0.6300	0.7000	0.7700	9.1835 (76)	
West						9.6800	19.6403	0.6300	0.7000	0.7700	58.1025 (80)	
Solar gains	67.2860	131.6257	216.7688	316.1443	387.4468	396.6207	377.5991	324.3520	252.1111	156.1850	83.8977	55.3327 (83)
Total gains	542.4630	602.9484	669.6587	740.5188	782.7835	765.8125	731.4130	685.5659	629.6467	562.4298	522.0522	517.4774 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000 (85)											
Utilisation factor for gains for living area, n1,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	75.5258	75.6291	75.7306	76.2112	76.3018	76.7264	76.7264	76.8056	76.5623	76.3018	76.1188	75.9283
alpha	6.0351	6.0419	6.0487	6.0807	6.0868	6.1151	6.1151	6.1204	6.1042	6.0868	6.0746	6.0619
util living area	0.9887	0.9775	0.9437	0.8471	0.6797	0.4913	0.3557	0.3959	0.6328	0.8966	0.9769	0.9912 (86)
MIT	20.2986	20.4341	20.6437	20.8592	20.9677	20.9961	20.9995	20.9991	20.9837	20.8276	20.5206	20.2619 (87)
Th 2	20.1510	20.1520	20.1531	20.1580	20.1589	20.1632	20.1632	20.1640	20.1615	20.1589	20.1570	20.1551 (88)
util rest of house	0.9854	0.9712	0.9288	0.8131	0.6269	0.4286	0.2883	0.3244	0.5629	0.8638	0.9692	0.9886 (89)
MIT 2	19.2318	19.4266	19.7207	20.0067	20.1307	20.1608	20.1630	20.1636	20.1502	19.9761	19.5567	19.1822 (90)
Living area fraction	19.7342	19.9011	20.1554	20.4082	20.5249	20.5542	20.5570	20.5571	20.5427	20.3771	20.0106	19.6907 (91)
MIT	19.7342	19.9011	20.1554	20.4082	20.5249	20.5542	20.5570	20.5571	20.5427	20.3771	20.0106	19.6907 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7342	19.9011	20.1554	20.4082	20.5249	20.5542	20.5570	20.5571	20.5427	20.3771	20.0106	19.6907 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9834	0.9689	0.9288	0.8238	0.6583	0.4581	0.3200	0.3581	0.5953	0.8731	0.9676	0.9869 (94)
Ext temp.	533.4384	584.2131	621.9770	610.0288	509.0892	350.7856	234.0745	245.5219	374.8403	491.0671	505.1384	510.6792 (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	928.1217	900.8409	818.9309	685.8087	525.2790	352.4455	234.2252	245.8182	382.1829	581.9569	770.3202	926.5765 (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	293.6444	212.7739	146.5337	54.5615	12.0519	0.0000	0.0000	0.0000	0.0000	67.6220	190.9308	309.4276 (98)
Space heating per m2												1287.5458 (98)
										(98) / (4) =		19.6872 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 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)
Fraction of main heating from main system 2													0.0000 (203)
Fraction of total heating from main system 1													1.0000 (204)
Fraction of total heating from main system 2													0.0000 (205)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1287.5458 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	293.6444	212.7739	146.5337	54.5615	12.0519	0.0000	0.0000	0.0000	0.0000	67.6220	190.9308	309.4276	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	293.6444	212.7739	146.5337	54.5615	12.0519	0.0000	0.0000	0.0000	0.0000	67.6220	190.9308	309.4276	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Water heating requirement	165.2431	145.2940	151.7618	134.8947	131.3598	116.1785	110.4391	122.7547	123.0295	139.9344	149.4118	160.8795	(64)
Efficiency of water heater (217)m	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	(216)
Fuel for water heating, kWh/month	47.2920	41.5827	43.4337	38.6064	37.5947	33.2499	31.6073	35.1320	35.2106	40.0488	42.7612	46.0432	(219)
Water heating fuel used													(219)
Annual totals kWh/year													
Space heating fuel - main system													1287.5458 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year													0.0000 (231)
Electricity for lighting (calculated in Appendix L)													302.1225 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.50 * 1000 * 1.00) =													-431.8098 (233)
Total delivered energy for all uses													1630.4211 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1287.5458	13.1900	169.8273 (240)
Space heating - main system 2	0.0000	13.1900	0.0000 (241)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	472.5626	13.1900	62.3310 (247)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Energy for lighting	302.1225	13.1900	39.8500 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit	-431.8098	13.1900	-56.9557 (252)
Total energy cost			215.0525 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.4200 (256)
SAP value		0.8181 (257)
SAP rating (Section 12)		88.5870
SAP band		89 (258)
		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1287.5458	0.5190	668.2363 (261)
Space heating - main system 2	0.0000	0.5190	0.0000 (262)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	472.5626	0.5190	245.2600 (264)
Space and water heating			913.4963 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	302.1225	0.5190	156.8016 (268)
Energy saving/generation technologies			
PV Unit	-431.8098	0.5190	-224.1093 (269)
Total kg/year			846.1885 (272)
CO2 emissions per m2			12.9400 (273)
EI value			89.7292
EI rating			90 (274)
EI band			B

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

Calculation of stars for heating and DHW

Main heating 1 energy efficiency	$13.19 \times (1 + 0.29 \times 0.00) / 1.0000 = 13.190$, stars = 1
Main heating 2 energy efficiency	(does water heating only)
Main heating 1 environmental impact	$0.519 \times (1 + 0.29 \times 0.00) / 1.0000 = 0.5190$, stars = 2
Main heating 2 environmental impact	(does water heating only)
Water heating energy efficiency	$13.19 / 3.4941 = 3.775$, stars = 5
Water heating environmental impact	$0.519 / 3.4941 = 0.1485$, stars = 5

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	65.4000 (1b)	x 2.4000 (2b)	= 156.9600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.4000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 156.9600 (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				1 * 10 =	10.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				10.0000 / (5) = 0.0637 (8)
Pressure test					Yes
Measured/design AP50					4.0000
Infiltration rate					0.2637 (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) =				0.2242 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infiltr rate	0.2354	0.2242	0.2242	0.2073	0.2073	0.1849	0.1905	0.1793	0.1849	0.1961	0.1961	0.2129 (22b)
Effective ac	0.5277	0.5251	0.5251	0.5215	0.5215	0.5171	0.5182	0.5161	0.5171	0.5192	0.5192	0.5227 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.9500	1.0000	1.9500		(26)					
Window (Uw = 1.20)			11.2100	1.1450	12.8359		(27)					
Heat Loss Floor 1			65.4000	0.1065	6.9642		(28b)					
External Wall 1	42.9600	11.2100	31.7500	0.1800	5.7150		(29a)					
shelterd wall	18.0000	1.9500	16.0500	0.1671	2.6815		(29a)					
Total net area of external elements Aum(A, m2)			126.3600				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.1465		(33)					
Party Wall 1			20.6400	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							1.9737 (36)					
Total fabric heat loss						(33) + (36) =	32.1202 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 27.3330	Feb 27.1997	Mar 27.1997	Apr 27.0118	May 27.0118	Jun 26.7841	Jul 26.8386	Aug 26.7312	Sep 26.7841	Oct 26.8947	Nov 26.8947	Dec 27.0728 (38)
Heat transfer coeff	59.4533	59.3199	59.3199	59.1320	59.1320	58.9043	58.9588	58.8514	58.9043	59.0149	59.0149	59.1930 (39)
Average = Sum(39)m / 12 =												59.0999 (39)
HLP	Jan 0.9091	Feb 0.9070	Mar 0.9070	Apr 0.9042	May 0.9042	Jun 0.9007	Jul 0.9015	Aug 0.8999	Sep 0.9007	Oct 0.9024	Nov 0.9024	Dec 0.9051 (40)
HLP (average)												0.9037 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1295 (42)
Average daily hot water use (litres/day)												84.7756 (43)
Daily hot water use	Jan 93.2531	Feb 89.8621	Mar 86.4711	Apr 83.0801	May 79.6890	Jun 76.2980	Jul 76.2980	Aug 79.6890	Sep 83.0801	Oct 86.4711	Nov 89.8621	Dec 93.2531 (44)
Energy conte	138.2917	120.9508	124.8104	108.8127	104.4084	90.0965	83.4877	95.8033	96.9475	112.9830	123.3298	133.9281 (45)
Energy content (annual)												Total = Sum(45)m = 1333.8499 (45)
Distribution loss (46)m = 0.15 x (45)m	20.7438	18.1426	18.7216	16.3219	15.6613	13.5145	12.5231	14.3705	14.5421	16.9474	18.4995	20.0892 (46)
Water storage loss:												201.0000 (47)
Store volume												1.6100 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

Enter (49) or (54) in (55)												0.8694 (55)	
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)	
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (57)	
Primary 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 (59)	
Total heat required for water heating calculated for each month													
	165.2431	145.2940	151.7618	134.8947	131.3598	116.1785	110.4391	122.7547	123.0295	139.9344	149.4118	160.8795 (62)	
Solar input	0.0000	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	165.2431	145.2940	151.7618	134.8947	131.3598	116.1785	110.4391	122.7547	123.0295	139.9344	149.4118	160.8795 (64)	
												Total per year (kWh/year) = Sum(64)m = 1651.1809 (64)	
Heat gains from water heating, kWh/month	45.9820	40.2161	41.4995	36.1802	34.7158	29.9571	27.7596	31.8546	32.2350	37.5668	41.0071	44.5311 (65)	

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	127.7699	127.7699	127.7699	127.7699	127.7699	127.7699	127.7699	127.7699	127.7699	127.7699	127.7699	127.7699 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	42.7686	37.9867	30.8928	23.3879	17.4827	14.7596	15.9483	20.7302	27.8240	35.3290	41.2342	43.9572 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	278.1083	280.9942	273.7218	258.2398	238.6966	220.3287	208.0578	205.1719	212.4443	227.9263	247.4695	265.8374 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.9065	49.9065	49.9065	49.9065	49.9065	49.9065	49.9065	49.9065	49.9065	49.9065	49.9065	49.9065 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-85.1799	-85.1799	-85.1799	-85.1799	-85.1799	-85.1799	-85.1799	-85.1799	-85.1799	-85.1799	-85.1799	-85.1799 (71)
Water heating gains (Table 5)	61.8038	59.8455	55.7788	50.2503	46.6610	41.6071	37.3114	42.8153	44.7709	50.4931	56.9544	59.8536 (72)
Total internal gains	475.1770	471.3227	452.8899	424.3744	395.3367	369.1918	353.8139	361.2139	377.5357	406.2448	438.1545	462.1447 (73)

6. Solar gains

[Jan]			Area m2			Solar Flux Table 6a W/m2			Specific data or Table 6b			Specific FF or Table 6c			Access factor Table 6d			Gains W
East			1.5300			22.3313			0.6300			0.7000			0.7700			10.4419 (76)
West			9.6800			22.3313			0.6300			0.7000			0.7700			66.0635 (80)
Solar gains	76.5053	134.6222	218.6027	327.6228	390.3764	427.3384	402.5700	354.1662	275.2803	170.4676	97.7262	62.3038	(83)					
Total gains	551.6824	605.9449	671.4926	751.9972	785.7131	796.5302	756.3839	715.3801	652.8160	576.7124	535.8807	524.4485	(84)					

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000 (85)											
Utilisation factor for gains for living area, n1,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	76.3905	76.5623	76.5623	76.8056	76.8056	77.1025	77.0312	77.1717	77.1025	76.9580	76.9580	76.7264
alpha	6.0927	6.1042	6.1042	6.1204	6.1204	6.1402	6.1354	6.1448	6.1402	6.1305	6.1305	6.1151
util living area	0.9840	0.9710	0.9249	0.7950	0.5910	0.3692	0.2416	0.2632	0.5186	0.8425	0.9638	0.9874 (86)
MIT	20.3955	20.5114	20.7210	20.9120	20.9870	20.9994	21.0000	20.9999	20.9954	20.8965	20.6230	20.3637 (87)
Th 2	20.1598	20.1615	20.1615	20.1640	20.1640	20.1669	20.1662	20.1676	20.1669	20.1655	20.1655	20.1632 (88)
util rest of house	0.9792	0.9627	0.9052	0.7535	0.5334	0.3080	0.1766	0.1948	0.4464	0.7973	0.9518	0.9836 (89)
MIT 2	19.3786	19.5444	19.8332	20.0752	20.1540	20.1667	20.1662	20.1676	20.1643	20.0649	19.7076	19.3359 (90)
Living area fraction	19.8575	19.9998	20.2513	20.4693	20.5463	20.5588	20.5589	20.5596	20.5557	20.4565	20.1387	19.8199 (91)
MIT	19.8575	19.9998	20.2513	20.4693	20.5463	20.5588	20.5589	20.5596	20.5557	20.4565	20.1387	19.8199 (92)
Temperature adjustment												0.0000
adjusted MIT	19.8575	19.9998	20.2513	20.4693	20.5463	20.5588	20.5589	20.5596	20.5557	20.4565	20.1387	19.8199 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9772	0.9609	0.9075	0.7693	0.5601	0.3368	0.2072	0.2270	0.4804	0.8141	0.9514	0.9816 (94)
Ext temp.	539.0899	582.2244	609.4026	578.5171	440.0751	268.3098	156.7555	162.3920	313.5885	469.5279	509.8121	514.8244 (95)
Heat loss rate w	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Month fracti	877.3832	854.1945	762.3399	624.9848	446.2283	268.5342	156.7635	162.4058	315.4741	522.6670	716.3625	871.3170 (97)
Space heating	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	251.6903	182.7639	113.7854	33.4567	4.5779	0.0000	0.0000	0.0000	0.0000	39.5355	148.7163	265.2305 (98)
Space heating per m2												1039.7565 (98)
										(98) / (4) =		15.8984 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 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)
Fraction of main heating from main system 2													0.0000 (203)
Fraction of total heating from main system 1													1.0000 (204)
Fraction of total heating from main system 2													0.0000 (205)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1039.7565 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	251.6903	182.7639	113.7854	33.4567	4.5779	0.0000	0.0000	0.0000	0.0000	39.5355	148.7163	265.2305	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	251.6903	182.7639	113.7854	33.4567	4.5779	0.0000	0.0000	0.0000	0.0000	39.5355	148.7163	265.2305	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Water heating requirement	165.2431	145.2940	151.7618	134.8947	131.3598	116.1785	110.4391	122.7547	123.0295	139.9344	149.4118	160.8795	(64)
Efficiency of water heater (217)m	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	(216)
Fuel for water heating, kWh/month	47.2920	41.5827	43.4337	38.6064	37.5947	33.2499	31.6073	35.1320	35.2106	40.0488	42.7612	46.0432	(219)
Water heating fuel used												472.5626	(219)
Annual totals kWh/year													
Space heating fuel - main system												1039.7565	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												302.1225	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.50 * 1140 * 1.00) =												-456.0399	
Total delivered energy for all uses												-456.0399	(233)
												1358.4017	(238)

10a. Fuel costs - using BEDF prices (554)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1039.7565	25.0500	260.4590 (240)
Space heating - main system 2	0.0000	25.0500	0.0000 (241)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	472.5626	25.0500	118.3769 (247)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Energy for lighting	302.1225	25.0500	75.6817 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit	-456.0399	25.0500	-114.2380 (252)
Total energy cost			340.2796 (255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1039.7565	0.5190	539.6336 (261)
Space heating - main system 2	0.0000	0.5190	0.0000 (262)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	472.5626	0.5190	245.2600 (264)
Space and water heating			784.8936 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	302.1225	0.5190	156.8016 (268)
Energy saving/generation technologies			
PV Unit	-456.0399	0.5190	-236.6847 (269)
Total kg/year			705.0105 (272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1039.7565	3.0700	3192.0524 (261)
Space heating - main system 2	0.0000	3.0700	0.0000 (262)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	472.5626	3.0700	1450.7671 (264)
Space and water heating			4642.8195 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	302.1225	3.0700	927.5161 (268)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

Energy saving/generation technologies			
PV unit	-456.0399	3.0700	-1400.0425 (269)
Primary energy kwh/year			4170.2931 (272)
Primary energy kwh/m2/year			63.7659 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 89
Current environmental impact rating: B 90

(For testing purposes):	
A	Not considered
B	Not considered
C	Not considered
D	Not considered
E Low energy lighting	Already installed
F	Not considered
G	Not considered
H	Not considered
I	Not considered
J	Not considered
K	Not considered
M	Not considered
N Solar water heating	Not applicable
O	Not considered
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U Solar photovoltaic panels	Not applicable
A2	Not considered
A3	Not considered
T2	Not considered
W	Not considered
X	Not considered
Y	Not considered
J2	Not considered
Q2	Not considered
Z1	Not considered
Z2	Not considered
Z3	Not considered
Z4	Not considered
Z5	Not considered
V2 Wind turbine	Not applicable
L2	Not considered
Q3	Not considered
O3	Not considered

Recommended measures: (none) SAP change Cost change CO2 change

Recommended measures (none)	Typical annual savings	Energy efficiency	Environmental impact
	Total Savings £0		0.00 kg/m²

Potential energy efficiency rating: B 89
Potential environmental impact rating: B 90

Fuel prices for cost data on this page from database revision number 554 TEST (31 Oct 2024)
Recommendation texts revision number 4.9c (22 Feb 2014)

Typical heating and lighting costs of this home (per year, Thames Valley):			
	Current £455	Potential £455	Saving £0
Electricity			
Space heating	£260	£260	£0
Water heating	£118	£118	£0
Lighting	£76	£76	£0
Generated (PV)	-£114	-£114	£0
Total cost of fuels	£341	£341	£0
Total cost of uses	£340	£340	£0
Delivered energy	21 kWh/m²	21 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.7 tonnes	0.7 tonnes	0.0 tonnes
CO2 emissions per m²	11 kg/m²	11 kg/m²	0 kg/m²
Primary energy	64 kWh/m²	64 kWh/m²	0 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	2455-06-Flat 12	Issued on Date	05/05/2025
Assessment Reference	012	Prop Type Ref	
Property			

SAP Rating	84 B	DER	20.88	TER	26.72
Environmental	86 B	% DER<TER	21.87		
CO ₂ Emissions (t/year)	1.08	DFEE	40.72	TFEE	52.72
General Requirements Compliance	Pass	% DFEE<TFEE	22.77		

Assessor Details	Mrs. Naomi Sadler, Sadler Energy & Environmental Services Ltd, Tel: 01962 718870, naomi.sadler@sadlerenergy.co.uk	Assessor ID	4611-0001
Client	RHB PARTNERSHIP LLP , RHB		

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	23.7000 (1b)	x 2.1000 (2b)	= 49.7700 (1b) - (3b)
First floor	52.9000 (1c)	x 2.4000 (2c)	= 126.9600 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	76.6000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 176.7300 (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	Air changes per hour	0.1132 (8)
Pressure test		Yes	4.0000
Measured/design AP50			0.3132 (18)
Infiltration rate			2 (19)
Number of sides sheltered			
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.2662 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate	0.2795	0.2662	0.2662	0.2462	0.2462	0.2196	0.2263	0.2130	0.2196	0.2329	0.2329	0.2529 (22b)
Effective ac	0.5391	0.5354	0.5354	0.5303	0.5303	0.5241	0.5256	0.5227	0.5241	0.5271	0.5271	0.5320 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.9500	1.0000	1.9500		(26)
Window (Uw = 1.20)			13.6900	1.1450	15.6756		(27)
roof ligh (Uw = 1.20)			1.6200	1.1450	1.8550		(27a)
External Wall 1	65.1600	13.6900	51.4700	0.1800	9.2646		(29a)
shelterd wall	15.8400	1.9500	13.8900	0.1671	2.3206		(29a)
ashlar	20.2500		20.2500	0.1651	3.3440		(29a)
External Roof 1	78.4000	1.6200	76.7800	0.1400	10.7492		(30)
Total net area of external elements Aum(A, m ²)			179.6500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		45.1590		(33)
Party Wall 1			16.3200	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K	250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	4.0580 (36)
Total fabric heat loss	(33) + (36) = 49.2170 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 31.4385	Feb 31.2267	Mar 31.2267	Apr 30.9284	May 30.9284	Jun 30.5668	Jul 30.6533	Aug 30.4829	Sep 30.5668	Oct 30.7424	Nov 30.7424	Dec 31.0252 (38)



FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF HEAT DEMAND 09 Jan 2014

Heat transfer coeff	80.6555	80.4437	80.4437	80.1454	80.1454	79.7838	79.8703	79.6999	79.7838	79.9594	79.9594	80.2422 (39)
Average = Sum(39)m / 12 =												80.0944 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0529	1.0502	1.0502	1.0463	1.0463	1.0416	1.0427	1.0405	1.0416	1.0439	1.0439	1.0475 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kwh/year)

Assumed occupancy												2.3952 (42)
Average daily hot water use (litres/day)												91.0856 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	100.1942	96.5508	92.9073	89.2639	85.6205	81.9771	81.9771	85.6205	89.2639	92.9073	96.5508	100.1942 (44)
Energy content (annual)	148.5851	129.9535	134.1003	116.9119	112.1798	96.8026	89.7019	102.9342	104.1636	121.3926	132.5095	143.8967 (45)
Energy content (annual)												Total = Sum(45)m = 1433.1316 (45)
Distribution loss (46)m = 0.15 x (45)m	22.2878	19.4930	20.1151	17.5368	16.8270	14.5204	13.4553	15.4401	15.6245	18.2089	19.8764	21.5845 (46)
Water storage loss:												
Store volume												201.0000 (47)
a) If manufacturer declared loss factor is known (kwh/day):												1.6100 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8694 (55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)
If cylinder contains dedicated solar storage												
Primary 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	175.5365	154.2967	161.0517	142.9939	139.1312	122.8846	116.6533	129.8856	130.2456	148.3440	158.5915	170.8481 (62)
Solar input	0.0000	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	175.5365	154.2967	161.0517	142.9939	139.1312	122.8846	116.6533	129.8856	130.2456	148.3440	158.5915	170.8481 (64)
RHI water heating demand												1750.4626 (64)
Heat gains from water heating, kwh/month	49.4045	43.2095	44.5884	38.8732	37.2998	32.1869	29.8259	34.2256	34.6344	40.3630	44.0594	47.8457 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	143.7111	143.7111	143.7111	143.7111	143.7111	143.7111	143.7111	143.7111	143.7111	143.7111	143.7111	143.7111 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	47.5285	42.2144	34.3311	25.9908	19.4285	16.4023	17.7233	23.0374	30.9207	39.2610	45.8234	48.8495 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	316.6989	319.9852	311.7037	294.0734	271.8184	250.9017	236.9281	233.6418	241.9233	259.5536	281.8086	302.7253 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.7663	51.7663	51.7663	51.7663	51.7663	51.7663	51.7663	51.7663	51.7663	51.7663	51.7663	51.7663 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074 (71)
Water heating gains (Table 5)	66.4040	64.2999	59.9306	53.9906	50.1341	44.7040	40.0885	46.0022	48.1033	54.2514	61.1936	64.3087 (72)
Total internal gains	530.3013	526.1695	505.6354	473.7248	441.0509	411.6780	394.4099	402.3513	420.6173	452.7359	488.4956	515.5534 (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				1.6100	11.9814	0.6300	0.7000	0.7700	5.8953 (74)			
East				12.0800	22.3313	0.6300	0.7000	0.7700	82.4429 (76)			
North				1.6200	30.0000	0.6300	0.7000	1.0000	19.2893 (82)			
Solar gains	107.6275	191.3049	315.9249	482.8324	583.8434	643.2466	604.2838	525.3673	400.9676	243.6905	137.8565	87.4258 (83)
Total gains	637.9288	717.4744	821.5602	956.5572	1024.8943	1054.9247	998.6938	927.7187	821.5849	696.4264	626.3521	602.9792 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, n11,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	65.9527	66.1263	66.1263	66.3724	66.3724	66.6732	66.6010	66.7435	66.6732	66.5268	66.5268	66.2923
alpha	5.3968	5.4084	5.4084	5.4248	5.4248	5.4449	5.4401	5.4496	5.4449	5.4351	5.4351	5.4195
util living area	0.9883	0.9774	0.9370	0.8122	0.6063	0.3770	0.2478	0.2747	0.5522	0.8749	0.9737	0.9908 (86)
MIT	20.1862	20.3287	20.5952	20.8591	20.9752	20.9984	20.9999	20.9998	20.9886	20.8221	20.4629	20.1524 (87)
Th 2	20.0394	20.0417	20.0417	20.0449	20.0449	20.0488	20.0479	20.0497	20.0488	20.0469	20.0469	20.0439 (88)
util rest of house												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF HEAT DEMAND 09 Jan 2014

	0.9845	0.9704	0.9187	0.7685	0.5409	0.3059	0.1718	0.1933	0.4667	0.8314	0.9640	0.9879 (89)
MIT 2	18.9849	19.1904	19.5622	19.9023	20.0263	20.0482	20.0479	20.0497	20.0426	19.8704	19.3888	18.9396 (90)
Living area fraction									fLA =	Living area / (4) =		0.4151 (91)
MIT	19.4836	19.6629	19.9910	20.2995	20.4202	20.4427	20.4431	20.4441	20.4353	20.2655	19.8347	19.4431 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4836	19.6629	19.9910	20.2995	20.4202	20.4427	20.4431	20.4441	20.4353	20.2655	19.8347	19.4431 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9818	0.9671	0.9176	0.7809	0.5671	0.3354	0.2034	0.2271	0.5020	0.8424	0.9614	0.9854 (94)
Useful gains	626.2889	693.8383	753.8364	746.9687	581.2592	353.8328	203.0905	210.6865	412.4655	586.6995	602.1700	594.2010 (95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Heat loss rate w	1160.1171	1131.2738	1012.8676	833.4732	594.6961	354.4538	203.1184	210.7371	417.6940	692.8869	946.2935	1150.9238 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kwh	397.1682	293.9567	192.7192	62.2832	9.9971	0.0000	0.0000	0.0000	0.0000	79.0034	247.7689	414.2018 (98)
Space heating												1697.0985 (98)
RHI space heating demand												1697 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	23.7000 (1b)	x 2.1000 (2b)	= 49.7700 (1b) - (3b)
First floor	52.9000 (1c)	x 2.4000 (2c)	= 126.9600 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	76.6000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	176.7300 (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) = 0.1132 (8)
Pressure test					Yes
Measured/design AP50					4.0000
Infiltration rate					0.3132 (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) =				0.2662 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infiltr rate	0.3394	0.3327	0.3261	0.2928	0.2862	0.2529	0.2529	0.2462	0.2662	0.2862	0.2995	0.3128 (22b)
Effective ac	0.5576	0.5554	0.5532	0.5429	0.5409	0.5320	0.5320	0.5303	0.5354	0.5409	0.5448	0.5489 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.9500	1.0000	1.9500		(26)
Window (Uw = 1.20)			13.6900	1.1450	15.6756		(27)
roof ligh (Uw = 1.20)			1.6200	1.1450	1.8550		(27a)
External Wall 1	65.1600	13.6900	51.4700	0.1800	9.2646		(29a)
shelterd wall	15.8400	1.9500	13.8900	0.1671	2.3206		(29a)
ashlar	20.2500		20.2500	0.1651	3.3440		(29a)
External Roof 1	78.4000	1.6200	76.7800	0.1400	10.7492		(30)
Total net area of external elements Aum(A, m ²)			179.6500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		45.1590		(33)
Party Wall 1			16.3200	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.0580 (36)
Total fabric heat loss						(33) + (36) =	49.2170 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	32.5194	32.3890	32.2611	31.6606	31.5483	31.0252	31.0252	30.9284	31.2267	31.5483	31.7756	32.0132 (38)
Heat transfer coeff	81.7364	81.6060	81.4781	80.8776	80.7653	80.2422	80.2422	80.1454	80.4437	80.7653	80.9926	81.2302 (39)
Average = Sum(39)m / 12 =												80.8771 (39)
HLP	1.0671	1.0654	1.0637	1.0558	1.0544	1.0475	1.0475	1.0463	1.0502	1.0544	1.0573	1.0604 (40)
HLP (average)												1.0558 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3952 (42)
Average daily hot water use (litres/day)												91.0856 (43)
Jan	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	100.1942	96.5508	92.9073	89.2639	85.6205	81.9771	81.9771	85.6205	89.2639	92.9073	96.5508	100.1942 (44)
Energy conte	148.5851	129.9535	134.1003	116.9119	112.1798	96.8026	89.7019	102.9342	104.1636	121.3926	132.5095	143.8967 (45)
Energy content (annual)										Total = Sum(45)m =		1433.1316 (45)
Distribution loss (46)m = 0.15 x (45)m												
22.2878	19.4930	20.1151	17.5368	16.8270	14.5204	13.4553	15.4401	15.6245	18.2089	19.8764	21.5845 (46)	
Water storage loss:												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 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)
Fraction of main heating from main system 2													0.0000 (203)
Fraction of total heating from main system 1													1.0000 (204)
Fraction of total heating from main system 2													0.0000 (205)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2061.5314 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	455.6944	336.6163	240.8521	96.3731	23.9592	0.0000	0.0000	0.0000	0.0000	124.8305	307.9084	475.2975	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	455.6944	336.6163	240.8521	96.3731	23.9592	0.0000	0.0000	0.0000	0.0000	124.8305	307.9084	475.2975	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Water heating requirement	175.5365	154.2967	161.0517	142.9939	139.1312	122.8846	116.6533	129.8856	130.2456	148.3440	158.5915	170.8481	(64)
Efficiency of water heater (217)m	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	(216)
Fuel for water heating, kWh/month	50.2380	44.1592	46.0925	40.9244	39.8189	35.1692	33.3858	37.1728	37.2759	42.4556	45.3884	48.8962	(219)
Water heating fuel used												500.9767	(219)
Annual totals kWh/year													
Space heating fuel - main system												2061.5314	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												335.7476	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.00 * 0.50 * 1000 * 1.00) =										-431.8098		-431.8098	(233)
Total delivered energy for all uses												2466.4459	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2061.5314	13.1900	271.9160 (240)
Space heating - main system 2	0.0000	13.1900	0.0000 (241)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	500.9767	13.1900	66.0788 (247)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Energy for lighting	335.7476	13.1900	44.2851 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit	-431.8098	13.1900	-56.9557 (252)
Total energy cost			325.3242 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.1237 (257)
SAP value		84.3250
SAP rating (Section 12)		84 (258)
SAP band		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2061.5314	0.5190	1069.9348 (261)
Space heating - main system 2	0.0000	0.5190	0.0000 (262)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	500.9767	0.5190	260.0069 (264)
Space and water heating			1329.9417 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	335.7476	0.5190	174.2530 (268)
Energy saving/generation technologies			
PV Unit	-431.8098	0.5190	-224.1093 (269)
Total kg/year			1280.0854 (272)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

CO2 emissions per m2	16.7100 (273)
EI value	85.8938
EI rating	86 (274)
EI band	B

Calculation of stars for heating and DHW

Main heating 1 energy efficiency	$13.19 \times (1 + 0.29 \times 0.00) / 1.0000 = 13.190$, stars = 1 (does water heating only)
Main heating 2 energy efficiency	
Main heating 1 environmental impact	$0.519 \times (1 + 0.29 \times 0.00) / 1.0000 = 0.5190$, stars = 2 (does water heating only)
Main heating 2 environmental impact	
Water heating energy efficiency	$13.19 / 3.4941 = 3.775$, stars = 5
Water heating environmental impact	$0.519 / 3.4941 = 0.1485$, stars = 5

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	23.7000 (1b)	x 2.1000 (2b)	= 49.7700 (1b) - (3b)
First floor	52.9000 (1c)	x 2.4000 (2c)	= 126.9600 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	76.6000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	176.7300 (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) = 0.1132 (8)
Pressure test					Yes
Measured/design AP50					4.0000
Infiltration rate					0.3132 (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) =				0.2662 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infiltr rate	0.2795	0.2662	0.2662	0.2462	0.2462	0.2196	0.2263	0.2130	0.2196	0.2329	0.2329	0.2529 (22b)
Effective ac	0.5391	0.5354	0.5354	0.5303	0.5303	0.5241	0.5256	0.5227	0.5241	0.5271	0.5271	0.5320 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.9500	1.0000	1.9500		(26)
Window (Uw = 1.20)			13.6900	1.1450	15.6756		(27)
roof ligh (Uw = 1.20)			1.6200	1.1450	1.8550		(27a)
External Wall 1	65.1600	13.6900	51.4700	0.1800	9.2646		(29a)
shelterd wall	15.8400	1.9500	13.8900	0.1671	2.3206		(29a)
ashlar	20.2500		20.2500	0.1651	3.3440		(29a)
External Roof 1	78.4000	1.6200	76.7800	0.1400	10.7492		(30)
Total net area of external elements Aum(A, m ²)			179.6500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		45.1590		(33)
Party Wall 1			16.3200	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.0580 (36)
Total fabric heat loss						(33) + (36) =	49.2170 (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	31.4385	31.2267	31.2267	30.9284	30.9284	30.5668	30.6533	30.4829	30.5668	30.7424	30.7424	31.0252 (38)
Heat transfer coeff	80.6555	80.4437	80.4437	80.1454	80.1454	79.7838	79.8703	79.6999	79.7838	79.9594	79.9594	80.2422 (39)
Average = Sum(39)m / 12 =												80.0944 (39)
HLP	1.0529	1.0502	1.0502	1.0463	1.0463	1.0416	1.0427	1.0405	1.0416	1.0439	1.0439	1.0475 (40)
HLP (average)												1.0456 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3952 (42)
Average daily hot water use (litres/day)												91.0856 (43)
Jan	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	180.1942	96.5508	92.9073	89.2639	85.6205	81.9771	81.9771	85.6205	89.2639	92.9073	96.5508	100.1942 (44)
Energy conte	148.5851	129.9535	134.1003	116.9119	112.1798	96.8026	89.7019	102.9342	104.1636	121.3926	132.5095	143.8967 (45)
Energy content (annual)										Total = Sum(45)m =		1433.1316 (45)
Distribution loss (46)m = 0.15 x (45)m												
22.2878	19.4930	20.1151	17.5368	16.8270	14.5204	13.4553	15.4401	15.6245	18.2089	19.8764	21.5845 (46)	
Water storage loss:												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 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)
Fraction of main heating from main system 2													0.0000 (203)
Fraction of total heating from main system 1													1.0000 (204)
Fraction of total heating from main system 2													0.0000 (205)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1697.0985 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	397.1682	293.9567	192.7192	62.2832	9.9971	0.0000	0.0000	0.0000	0.0000	79.0034	247.7689	414.2018	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	397.1682	293.9567	192.7192	62.2832	9.9971	0.0000	0.0000	0.0000	0.0000	79.0034	247.7689	414.2018	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Water heating requirement	175.5365	154.2967	161.0517	142.9939	139.1312	122.8846	116.6533	129.8856	130.2456	148.3440	158.5915	170.8481	(64)
Efficiency of water heater (217)m	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	(216)
Fuel for water heating, kwh/month	50.2380	44.1592	46.0925	40.9244	39.8189	35.1692	33.3858	37.1728	37.2759	42.4556	45.3884	48.8962	(219)
Water heating fuel used													500.9767 (219)
Annual totals kwh/year													
Space heating fuel - main system													1697.0985 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
Total electricity for the above, kwh/year													0.0000 (231)
Electricity for lighting (calculated in Appendix L)													335.7476 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.50 * 1140 * 1.00) =										-456.0399			-456.0399 (233)
Total delivered energy for all uses													2077.7829 (238)

10a. Fuel costs - using BEDF prices (554)

	Fuel kwh/year	Fuel price p/kwh	Fuel cost £/year
Space heating - main system 1	1697.0985	25.0500	425.1232 (240)
Space heating - main system 2	0.0000	25.0500	0.0000 (241)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	500.9767	25.0500	125.4947 (247)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Energy for lighting	335.7476	25.0500	84.1048 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit	-456.0399	25.0500	-114.2380 (252)
Total energy cost			520.4846 (255)

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

	Energy kwh/year	Emission factor kg CO2/kwh	Emissions kg CO2/year
Space heating - main system 1	1697.0985	0.5190	880.7941 (261)
Space heating - main system 2	0.0000	0.5190	0.0000 (262)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	500.9767	0.5190	260.0069 (264)
Space and water heating			1140.8010 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	335.7476	0.5190	174.2530 (268)
Energy saving/generation technologies			
PV Unit	-456.0399	0.5190	-236.6847 (269)
Total kg/year			1078.3693 (272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kwh/year	Primary energy factor kg CO2/kwh	Primary energy kwh/year
Space heating - main system 1	1697.0985	3.0700	5210.0924 (261)
Space heating - main system 2	0.0000	3.0700	0.0000 (262)
Space heating - secondary	0.0000	0.0000	0.0000 (263)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

Water heating (other fuel)	500.9767	3.0700	1537.9984 (264)
Space and water heating			6748.0908 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	335.7476	3.0700	1030.7451 (268)
Energy saving/generation technologies			
PV Unit	-456.0399	3.0700	-1400.0425 (269)
Primary energy kwh/year			6378.7934 (272)
Primary energy kwh/m2/year			83.2741 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 84
Current environmental impact rating: B 86

(For testing purposes):

A	Not considered
B	Not considered
C	Not considered
D	Not considered
E Low energy lighting	Already installed
F	Not considered
G	Not considered
H	Not considered
I	Not considered
J	Not considered
K	Not considered
M	Not considered
N Solar water heating	Not applicable
O	Not considered
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U Solar photovoltaic panels	Not applicable
A2	Not considered
A3	Not considered
T2	Not considered
W	Not considered
X	Not considered
Y	Not considered
J2	Not considered
Q2	Not considered
Z1	Not considered
Z2	Not considered
Z3	Not considered
Z4	Not considered
Z5	Not considered
V2 Wind turbine	Not applicable
L2	Not considered
Q3	Not considered
O3	Not considered

Recommended measures: SAP change Cost change CO2 change
(none)

Recommended measures (none)	Typical annual savings	Energy efficiency	Environmental impact
	Total Savings £0		0.00 kg/m²

Potential energy efficiency rating: B 84
Potential environmental impact rating: B 86

Fuel prices for cost data on this page from database revision number 554 TEST (31 Oct 2024)
Recommendation texts revision number 4.9c (22 Feb 2014)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current £635	Potential £635	£0	Saving
Electricity				
Space heating	£425	£425	£0	
Water heating	£125	£125	£0	
Lighting	£84	£84	£0	
Generated (PV)	-£114	-£114	£0	
Total cost of fuels	£521	£521	£0	
Total cost of uses	£520	£520	£0	
Delivered energy	27 kWh/m²	27 kWh/m²	0 kWh/m²	
Carbon dioxide emissions	1.1 tonnes	1.1 tonnes	0 tonnes	
CO2 emissions per m²	14 kg/m²	14 kg/m²	0 kg/m²	
Primary energy	83 kWh/m²	83 kWh/m²	0 kWh/m²	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	2455-06- Flat 13	Issued on Date	02/05/2025
Assessment Reference	013	Prop Type Ref	
Property			

SAP Rating	86 B	DER	18.78	TER	24.79
Environmental	88 B	% DER<TER	24.25		
CO ₂ Emissions (t/year)	0.96	DFEE	36.03	TFEE	46.49
General Requirements Compliance	Pass	% DFEE<TFEE	22.51		

Assessor Details	Mrs. Naomi Sadler, Sadler Energy & Environmental Services Ltd, Tel: 01962 718870, naomi.sadler@sadlerenergy.co.uk	Assessor ID	4611-0001
Client	RHB PARTNERSHIP LLP , RHB		

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	23.7000 (1b)	x 2.1000 (2b)	= 49.7700 (1b) - (3b)
First floor	55.4000 (1c)	x 2.4000 (2c)	= 132.9600 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.1000		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 182.7300 (5)
Dwelling volume			

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	Air changes per hour (5) =	0.1095 (8)
Pressure test		Yes	
Measured/design AP50		4.0000	
Infiltration rate		0.3095 (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) =	0.2630 (21)	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate	0.2762	0.2630	0.2630	0.2433	0.2433	0.2170	0.2236	0.2104	0.2170	0.2302	0.2302	0.2499 (22b)
Effective ac	0.5381	0.5346	0.5346	0.5296	0.5296	0.5235	0.5250	0.5221	0.5235	0.5265	0.5265	0.5312 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.9500	1.0000	1.9500		(26)
Window (Uw = 1.20)			12.8900	1.1450	14.7595		(27)
roof ligh (Uw = 1.20)			0.8100	1.1450	0.9275		(27a)
External Wall 1	34.5600	12.8900	21.6700	0.1800	3.9006		(29a)
shelterd wall	19.4400	1.9500	17.4900	0.1671	2.9220		(29a)
ashlar	20.2500		20.2500	0.1651	3.3440		(29a)
External Roof 1	78.4000	0.8100	77.5900	0.1400	10.8626		(30)
Total net area of external elements Aum(A, m ²)			152.6500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	38.6663			(33)
Party Wall 1			16.3200	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K	250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	3.6516 (36)
Total fabric heat loss	(33) + (36) = 42.3179 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	32.4503	32.2365	32.2365	31.9353	31.9353	31.5702	31.6576	31.4855	31.5702	31.7475	31.7475	32.0331 (38)



FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF HEAT DEMAND 09 Jan 2014

Heat transfer coeff	74.7682	74.5544	74.5544	74.2532	74.2532	73.8882	73.9755	73.8034	73.8882	74.0655	74.0655	74.3510 (39)
Average = Sum(39)m / 12 =												74.2017 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9452	0.9425	0.9425	0.9387	0.9387	0.9341	0.9352	0.9330	0.9341	0.9364	0.9364	0.9400 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kwh/year)

Assumed occupancy												2.4456 (42)
Average daily hot water use (litres/day)												92.2821 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	101.5103	97.8190	94.1278	90.4365	86.7452	83.0539	83.0539	86.7452	90.4365	94.1278	97.8190	101.5103 (44)
Energy content (annual)	150.5369	131.6605	135.8619	118.4477	113.6533	98.0742	90.8802	104.2863	105.5318	122.9872	134.2501	145.7869 (45)
Energy content (annual)												1451.9569 (45)
Distribution loss (46)m = 0.15 x (45)m	22.5805	19.7491	20.3793	17.7671	17.0480	14.7111	13.6320	15.6429	15.8298	18.4481	20.1375	21.8680 (46)
Water storage loss:												
Store volume												201.0000 (47)
a) If manufacturer declared loss factor is known (kwh/day):												1.6100 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8694 (55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)
If cylinder contains dedicated solar storage												
Primary 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	177.4883	156.0037	162.8133	144.5297	140.6047	124.1562	117.8316	131.2377	131.6138	149.9386	160.3321	172.7383 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	177.4883	156.0037	162.8133	144.5297	140.6047	124.1562	117.8316	131.2377	131.6138	149.9386	160.3321	172.7383 (64)
RHI water heating demand												1769.2879 (64)
Heat gains from water heating, kwh/month	50.0535	43.7771	45.1741	39.3838	37.7897	32.6097	30.2177	34.6752	35.0893	40.8932	44.6382	48.4742 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	146.7338	146.7338	146.7338	146.7338	146.7338	146.7338	146.7338	146.7338	146.7338	146.7338	146.7338	146.7338 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	49.7390	44.1777	35.9278	27.1996	20.3320	17.1652	18.5476	24.1088	32.3588	41.0869	47.9545	51.1214 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	324.7004	328.0698	319.5791	301.5033	278.6860	257.2409	242.9142	239.5449	248.0356	266.1113	288.9287	310.3738 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.1189	52.1189	52.1189	52.1189	52.1189	52.1189	52.1189	52.1189	52.1189	52.1189	52.1189	52.1189 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225 (71)
Water heating gains (Table 5)	67.2762	65.1445	60.7178	54.6998	50.7927	45.2912	40.6151	46.6065	48.7352	54.9640	61.9974	65.1534 (72)
Total internal gains	542.7458	538.4222	517.2548	484.4329	450.8409	420.7274	403.1071	411.2903	430.1598	463.1925	499.9108	527.6788 (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			0.8100		11.9814		0.6300		0.7000		0.7700		2.9660 (74)
East			12.0800		22.3313		0.6300		0.7000		0.7700		82.4429 (76)
South			0.8100		30.0000		0.6300		0.7000		1.0000		9.6447 (82)
Solar gains	95.0535	168.2193	275.8005	418.0304	502.3757	552.0094	519.1726	453.6109	348.8765	213.7345	121.6068		77.2975 (83)
Total gains	637.7993	706.6415	793.0553	902.4633	953.2165	972.7369	922.2797	864.9012	779.0362	676.9270	621.5176		604.9763 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, n11,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	73.4678	73.6785	73.6785	73.9773	73.9773	74.3428	74.2550	74.4282	74.3428	74.1649	74.1649	73.8800
alpha	5.8979	5.9119	5.9119	5.9318	5.9318	5.9562	5.9503	5.9619	5.9562	5.9443	5.9443	5.9253
util living area	0.9881	0.9774	0.9376	0.8142	0.6084	0.3791	0.2486	0.2730	0.5430	0.8677	0.9724	0.9907 (86)
MIT	20.3110	20.4355	20.6664	20.8896	20.9826	20.9991	20.9999	20.9999	20.9931	20.8656	20.5571	20.2885 (87)
Th 2	20.1292	20.1315	20.1315	20.1347	20.1347	20.1386	20.1377	20.1395	20.1386	20.1367	20.1367	20.1337 (88)
util rest of house												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF HEAT DEMAND 09 Jan 2014

	0.9844	0.9707	0.9201	0.7732	0.5481	0.3141	0.1795	0.1996	0.4657	0.8252	0.9627	0.9878 (89)
MIT 2	19.2335	19.4132	19.7348	20.0222	20.1214	20.1382	20.1377	20.1395	20.1347	20.0034	19.5929	19.1931 (90)
Living area fraction									fLA =	Living area / (4) =		0.4374 (91)
MIT	19.7048	19.8604	20.1423	20.4016	20.4981	20.5148	20.5148	20.5159	20.5102	20.3805	20.0147	19.6687 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7048	19.8604	20.1423	20.4016	20.4981	20.5148	20.5148	20.5159	20.5102	20.3805	20.0147	19.6687 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9821	0.9681	0.9203	0.7865	0.5738	0.3426	0.2097	0.2317	0.4994	0.8383	0.9611	0.9858 (94)
Useful gains	626.3930	684.1255	729.8619	709.8130	546.9874	333.2158	193.4203	200.4142	389.0585	567.4636	597.3205	596.3567 (95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Heat loss rate w	1091.9769	1063.1720	949.9926	779.7803	556.7605	333.5896	193.4344	200.4394	392.3621	650.3356	889.8712	1083.1985 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kwh	346.3945	254.7192	163.7773	50.3764	7.2711	0.0000	0.0000	0.0000	0.0000	61.6567	210.6365	362.2103 (98)
Space heating												1457.0422 (98)
RHI space heating demand												1457 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	23.7000 (1b)	x 2.1000 (2b)	= 49.7700 (1b) - (3b)
First floor	55.4000 (1c)	x 2.4000 (2c)	= 132.9600 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.1000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	182.7300 (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) = 0.1095 (8)
Pressure test					Yes
Measured/design AP50					4.0000
Infiltration rate					0.3095 (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) =				0.2630 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infiltr rate	0.3354	0.3288	0.3222	0.2893	0.2828	0.2499	0.2499	0.2433	0.2630	0.2828	0.2959	0.3091 (22b)
Effective ac	0.5562	0.5541	0.5519	0.5419	0.5400	0.5312	0.5312	0.5296	0.5346	0.5400	0.5438	0.5478 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.9500	1.0000	1.9500		(26)
Window (Uw = 1.20)			12.8900	1.1450	14.7595		(27)
roof ligh (Uw = 1.20)			0.8100	1.1450	0.9275		(27a)
External Wall 1	34.5600	12.8900	21.6700	0.1800	3.9006		(29a)
shelterd wall	19.4400	1.9500	17.4900	0.1671	2.9220		(29a)
ashlar	20.2500		20.2500	0.1651	3.3440		(29a)
External Roof 1	78.4000	0.8100	77.5900	0.1400	10.8626		(30)
Total net area of external elements Aum(A, m ²)			152.6500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		38.6663		(33)
Party Wall 1			16.3200	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							3.6516 (36)
Total fabric heat loss						(33) + (36) =	42.3179 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	33.5415	33.4098	33.2808	32.6745	32.5611	32.0331	32.0331	31.9353	32.2365	32.5611	32.7906	33.0304 (38)
Heat transfer coeff	75.8594	75.7278	75.5987	74.9925	74.8790	74.3510	74.3510	74.2532	74.5544	74.8790	75.1085	75.3484 (39)
Average = Sum(39)m / 12 =												74.9919 (39)
HLP	0.9590	0.9574	0.9557	0.9481	0.9466	0.9400	0.9400	0.9387	0.9425	0.9466	0.9495	0.9526 (40)
HLP (average)												0.9481 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4456 (42)
Average daily hot water use (litres/day)												92.2821 (43)
Daily hot water use	181.5103	97.8190	94.1278	90.4365	86.7452	83.0539	83.0539	86.7452	90.4365	94.1278	97.8190	101.5103 (44)
Energy conte	150.5369	131.6605	135.8619	118.4477	113.6533	98.0742	90.8802	104.2863	105.5318	122.9872	134.2501	145.7869 (45)
Energy content (annual)										Total = Sum(45)m =		1451.9569 (45)
Distribution loss (46)m = 0.15 x (45)m	22.5805	19.7491	20.3793	17.7671	17.0480	14.7111	13.6320	15.6429	15.8298	18.4481	20.1375	21.8680 (46)
Water storage loss:												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 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)
Fraction of main heating from main system 2													0.0000 (203)
Fraction of total heating from main system 1													1.0000 (204)
Fraction of total heating from main system 2													0.0000 (205)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1794.2315 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	401.8095	295.2712	208.7860	80.7847	18.7185	0.0000	0.0000	0.0000	0.0000	102.0453	266.7413	420.0749	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	401.8095	295.2712	208.7860	80.7847	18.7185	0.0000	0.0000	0.0000	0.0000	102.0453	266.7413	420.0749	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Water heating requirement	177.4883	156.0037	162.8133	144.5297	140.6047	124.1562	117.8316	131.2377	131.6138	149.9386	160.3321	172.7383	(64)
Efficiency of water heater (217)m	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	(216)
Fuel for water heating, kWh/month	50.7966	44.6478	46.5966	41.3639	40.2406	35.5331	33.7230	37.5598	37.6674	42.9119	45.8865	49.4371	(219)
Water heating fuel used												506.3644	(219)
Annual totals kWh/year													
Space heating fuel - main system												1794.2315	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												351.3625	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.00 * 0.50 * 1000 * 1.00) =											-431.8098	-431.8098	(233)
Total delivered energy for all uses												2220.1486	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1794.2315	13.1900	236.6591 (240)
Space heating - main system 2	0.0000	13.1900	0.0000 (241)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	506.3644	13.1900	66.7895 (247)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Energy for lighting	351.3625	13.1900	46.3447 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit	-431.8098	13.1900	-56.9557 (252)
Total energy cost			292.8376 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.4200 (256)
SAP value		0.9911 (257)
SAP rating (Section 12)		86.1746
SAP band		86 (258)
		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1794.2315	0.5190	931.2061 (261)
Space heating - main system 2	0.0000	0.5190	0.0000 (262)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	506.3644	0.5190	262.8031 (264)
Space and water heating			1194.0093 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	351.3625	0.5190	182.3571 (268)
Energy saving/generation technologies			
PV Unit	-431.8098	0.5190	-224.1093 (269)
Total kg/year			1152.2571 (272)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

CO2 emissions per m2
EI value
EI rating
EI band

14.5700 (273)
87.5582
88 (274)
B

Calculation of stars for heating and DHW

Main heating 1 energy efficiency $13.19 \times (1 + 0.29 \times 0.00) / 1.0000 = 13.190$, stars = 1
(does water heating only)
Main heating 2 energy efficiency $0.519 \times (1 + 0.29 \times 0.00) / 1.0000 = 0.5190$, stars = 2
(does water heating only)
Main heating 1 environmental impact $13.19 / 3.4941 = 3.775$, stars = 5
Main heating 2 environmental impact $0.519 / 3.4941 = 0.1485$, stars = 5
Water heating energy efficiency
Water heating environmental impact

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	23.7000 (1b)	x 2.1000 (2b)	= 49.7700 (1b) - (3b)
First floor	55.4000 (1c)	x 2.4000 (2c)	= 132.9600 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.1000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	182.7300 (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) = 0.1095 (8)
Pressure test					Yes
Measured/design AP50					4.0000
Infiltration rate					0.3095 (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) =				0.2630 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infiltr rate	0.2762	0.2630	0.2630	0.2433	0.2433	0.2170	0.2236	0.2104	0.2170	0.2302	0.2302	0.2499 (22b)
Effective ac	0.5381	0.5346	0.5346	0.5296	0.5296	0.5235	0.5250	0.5221	0.5235	0.5265	0.5265	0.5312 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.9500	1.0000	1.9500		(26)
Window (Uw = 1.20)			12.8900	1.1450	14.7595		(27)
roof ligh (Uw = 1.20)			0.8100	1.1450	0.9275		(27a)
External Wall 1	34.5600	12.8900	21.6700	0.1800	3.9006		(29a)
shelterd wall	19.4400	1.9500	17.4900	0.1671	2.9220		(29a)
ashlar	20.2500		20.2500	0.1651	3.3440		(29a)
External Roof 1	78.4000	0.8100	77.5900	0.1400	10.8626		(30)
Total net area of external elements Aum(A, m ²)			152.6500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		38.6663		(33)
Party Wall 1			16.3200	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							3.6516 (36)
Total fabric heat loss						(33) + (36) =	42.3179 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	32.4503	32.2365	32.2365	31.9353	31.9353	31.5702	31.6576	31.4855	31.5702	31.7475	31.7475	32.0331 (38)
Heat transfer coeff	74.7682	74.5544	74.5544	74.2532	74.2532	73.8882	73.9755	73.8034	73.8882	74.0655	74.0655	74.3510 (39)
Average = Sum(39)m / 12 =												74.2017 (39)
HLP	0.9452	0.9425	0.9425	0.9387	0.9387	0.9341	0.9352	0.9330	0.9341	0.9364	0.9364	0.9400 (40)
HLP (average)												0.9381 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4456 (42)
Average daily hot water use (litres/day)												92.2021 (43)
Daily hot water use	101.5103	97.8190	94.1278	90.4365	86.7452	83.0539	83.0539	86.7452	90.4365	94.1278	97.8190	101.5103 (44)
Energy conte	150.5369	131.6605	135.8619	118.4477	113.6533	98.0742	90.8802	104.2863	105.5318	122.9872	134.2501	145.7869 (45)
Energy content (annual)										Total = Sum(45)m =		1451.9569 (45)
Distribution loss (46)m = 0.15 x (45)m	22.5805	19.7491	20.3793	17.7671	17.0480	14.7111	13.6320	15.6429	15.8298	18.4481	20.1375	21.8680 (46)
Water storage loss:												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 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)
Fraction of main heating from main system 2													0.0000 (203)
Fraction of total heating from main system 1													1.0000 (204)
Fraction of total heating from main system 2													0.0000 (205)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1457.0422 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	346.3945	254.7192	163.7773	50.3764	7.2711	0.0000	0.0000	0.0000	0.0000	61.6567	210.6365	362.2103	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	346.3945	254.7192	163.7773	50.3764	7.2711	0.0000	0.0000	0.0000	0.0000	61.6567	210.6365	362.2103	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Water heating requirement	177.4883	156.0037	162.8133	144.5297	140.6047	124.1562	117.8316	131.2377	131.6138	149.9386	160.3321	172.7383	(64)
Efficiency of water heater (217)m	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	(216)
Fuel for water heating, kWh/month	50.7966	44.6478	46.5966	41.3639	40.2406	35.5331	33.7230	37.5598	37.6674	42.9119	45.8865	49.4371	(219)
Water heating fuel used												506.3644	(219)
Annual totals kWh/year													
Space heating fuel - main system												1457.0422	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												351.3625	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.50 * 1140 * 1.00) =										-456.0399		-456.0399	(233)
Total delivered energy for all uses												1858.7292	(238)

10a. Fuel costs - using BEDF prices (554)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1457.0422	25.0500	364.9891 (240)
Space heating - main system 2	0.0000	25.0500	0.0000 (241)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	506.3644	25.0500	126.8443 (247)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Energy for lighting	351.3625	25.0500	88.0163 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit	-456.0399	25.0500	-114.2380 (252)
Total energy cost			465.6117 (255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1457.0422	0.5190	756.2049 (261)
Space heating - main system 2	0.0000	0.5190	0.0000 (262)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	506.3644	0.5190	262.8031 (264)
Space and water heating			1019.0080 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	351.3625	0.5190	182.3571 (268)
Energy saving/generation technologies			
PV Unit	-456.0399	0.5190	-236.6847 (269)
Total kg/year			964.6804 (272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1457.0422	3.0700	4473.1195 (261)
Space heating - main system 2	0.0000	3.0700	0.0000 (262)
Space heating - secondary	0.0000	0.0000	0.0000 (263)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

Water heating (other fuel)	506.3644	3.0700	1554.5388 (264)
Space and water heating			6027.6582 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	351.3625	3.0700	1078.6829 (268)
Energy saving/generation technologies			
PV Unit	-456.0399	3.0700	-1400.0425 (269)
Primary energy kWh/year			5706.2986 (272)
Primary energy kWh/m2/year			72.1463 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 86
Current environmental impact rating: B 88

(For testing purposes):

A	Not considered
B	Not considered
C	Not considered
D	Not considered
E Low energy lighting	Already installed
F	Not considered
G	Not considered
H	Not considered
I	Not considered
J	Not considered
K	Not considered
M	Not considered
N Solar water heating	Not applicable
O	Not considered
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U Solar photovoltaic panels	Not applicable
A2	Not considered
A3	Not considered
T2	Not considered
W	Not considered
X	Not considered
Y	Not considered
J2	Not considered
Q2	Not considered
Z1	Not considered
Z2	Not considered
Z3	Not considered
Z4	Not considered
Z5	Not considered
V2 Wind turbine	Not applicable
L2	Not considered
Q3	Not considered
Q3	Not considered

Recommended measures: SAP change Cost change CO2 change
(none)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 86
Potential environmental impact rating: B 88

Fuel prices for cost data on this page from database revision number 554 TEST (31 Oct 2024)
Recommendation texts revision number 4.9c (22 Feb 2014)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current £580	Potential £580	Saving £0
Electricity			
Space heating	£365	£365	£0
Water heating	£127	£127	£0
Lighting	£88	£88	£0
Generated (PV)	-£114	-£114	£0
Total cost of fuels	£466	£466	£0
Total cost of uses	£466	£466	£0
Delivered energy	23 kWh/m²	23 kWh/m²	0 kWh/m²
Carbon dioxide emissions	1.0 tonnes	1.0 tonnes	0.0 tonnes
CO2 emissions per m²	12 kg/m²	12 kg/m²	0 kg/m²
Primary energy	72 kWh/m²	72 kWh/m²	0 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	2455-06-Flat 14	Issued on Date	05/05/2025
Assessment Reference	014	Prop Type Ref	
Property			

SAP Rating	88 B	DER	15.15	TER	22.99
Environmental	89 B	% DER<TER	34.10		
CO ₂ Emissions (t/year)	1.02	DFEE	39.25	TFEE	50.21
General Requirements Compliance	Pass	% DFEE<TFEE	21.83		

Assessor Details	Mrs. Naomi Sadler, Sadler Energy & Environmental Services Ltd, Tel: 01962 718870, naomi.sadler@sadlerenergy.co.uk	Assessor ID	4611-0001
Client	RHB PARTNERSHIP LLP , RHB		

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	114.6000 (1b)	2.4000 (2b)	275.0400 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	114.6000		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 275.0400 (5)
Dwelling volume			

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) =	0.0727 (8)
Pressure test				Yes	
Measured/design AP50				4.0000	
Infiltration rate				0.2727 (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) =	0.2318 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate	0.2434	0.2318	0.2318	0.2144	0.2144	0.1912	0.1970	0.1854	0.1912	0.2028	0.2028	0.2202 (22b)
Effective ac	0.5296	0.5269	0.5269	0.5230	0.5230	0.5183	0.5194	0.5172	0.5183	0.5206	0.5206	0.5242 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.9500	1.0000	1.9500		(26)
Window (Uw = 1.20)			19.3600	1.1450	22.1679		(27)
roof ligh (Uw = 1.20)			6.1600	1.1450	7.0534		(27a)
External Wall 1	57.3600	19.3600	38.0000	0.1800	6.8400		(29a)
5.04	19.4400	1.9500	17.4900	0.1671	2.9220		(29a)
External Roof 1	156.8000	6.1600	150.6400	0.1400	21.0896		(30)
Total net area of external elements Aum(A, m ²)			233.6000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		62.0230		(33)
Party Wall 1			42.0000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							3.6516 (36)
Total fabric heat loss						(33) + (36) =	65.6746 (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	48.0702	47.8202	47.8202	47.4681	47.4681	47.0414	47.1435	46.9423	47.0414	47.2487	47.2487	47.5824 (38)
Heat transfer coeff	113.7448	113.4949	113.4949	113.1428	113.1428	112.7160	112.8181	112.6170	112.7160	112.9233	112.9233	113.2571 (39)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF HEAT DEMAND 09 Jan 2014

Average = Sum(39)m / 12 = 113.0826 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9925	0.9904	0.9904	0.9873	0.9873	0.9836	0.9845	0.9827	0.9836	0.9854	0.9854	0.9883 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kwh/year)

Assumed occupancy 2.8398 (42)
Average daily hot water use (litres/day) 101.6452 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	111.8097	107.7439	103.6781	99.6123	95.5465	91.4807	91.4807	95.5465	99.6123	103.6781	107.7439	111.8097 (44)
Energy content (annual)	165.8106	145.0190	149.6466	130.4655	125.1848	108.0249	100.1010	114.8673	116.2392	135.4656	147.8713	160.5787 (45)
Distribution loss (46)m = 0.15 x (45)m	24.8716	21.7528	22.4470	19.5698	18.7777	16.2037	15.0151	17.2301	17.4359	20.3198	22.1807	24.0868 (46)
Water storage loss:												
Store volume												201.0000 (47)
a) If manufacturer declared loss factor is known (kwh/day):												1.6100 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8694 (55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (57)
Primary 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 (59)
Total heat required for water heating calculated for each month	192.7620	169.3622	176.5980	156.5475	152.1362	134.1069	127.0524	141.8187	142.3212	162.4170	173.9533	187.5301 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	192.7620	169.3622	176.5980	156.5475	152.1362	134.1069	127.0524	141.8187	142.3212	162.4170	173.9533	187.5301 (64)
RHI water heating demand												1917 (64)
Heat gains from water heating, kwh/month	55.1320	48.2188	49.7575	43.3798	41.6239	35.9183	33.2836	38.1934	38.6495	45.0423	49.1672	53.3924 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	170.3878	170.3878	170.3878	170.3878	170.3878	170.3878	170.3878	170.3878	170.3878	170.3878	170.3878	170.3878 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	61.9612	55.0334	44.7561	33.8833	25.3281	21.3831	23.1052	30.0330	40.3102	51.1831	59.7382	63.6833 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	414.9349	419.2406	408.3903	385.2913	356.1330	328.7283	310.4203	306.1146	316.9648	340.0638	369.2221	396.6268 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.8786	54.8786	54.8786	54.8786	54.8786	54.8786	54.8786	54.8786	54.8786	54.8786	54.8786	54.8786 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-113.5919	-113.5919	-113.5919	-113.5919	-113.5919	-113.5919	-113.5919	-113.5919	-113.5919	-113.5919	-113.5919	-113.5919 (71)
Water heating gains (Table 5)	74.1022	71.7542	66.8783	60.2497	55.9462	49.8865	44.7360	51.3352	53.6799	60.5407	68.2878	71.7640 (72)
Total internal gains	662.6727	657.7027	631.6993	591.0988	549.0818	511.6724	489.9360	499.1573	522.6295	563.4622	608.9227	643.7486 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	9.6800	11.9814	0.6300	0.7000	0.7700	35.4451 (74)
East	9.6800	22.3313	0.6300	0.7000	0.7700	66.0635 (76)
North	1.5400	30.0000	0.6300	0.7000	1.0000	18.3368 (82)
South	4.6200	30.0000	0.6300	0.7000	1.0000	55.0103 (82)

Solar gains	174.8557	314.6577	532.6509	840.1280	1041.0585	1159.3938	1084.1135	924.0759	684.4817	404.1755	224.6505	141.6690 (83)
Total gains	837.5284	972.3604	1164.3503	1431.2268	1590.1403	1671.0662	1574.0495	1423.2332	1207.1112	967.6376	833.5731	785.4176 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, n11,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	69.9666	70.1207	70.1207	70.3389	70.3389	70.6052	70.5413	70.6673	70.6052	70.4756	70.4756	70.2679
alpha	5.6644	5.6747	5.6747	5.6893	5.6893	5.7070	5.7028	5.7112	5.7070	5.6984	5.6984	5.6845
util living area	0.9931	0.9838	0.9415	0.7898	0.5590	0.3368	0.2222	0.2531	0.5340	0.8871	0.9824	0.9949 (86)
MIT	20.1759	20.3321	20.6224	20.8940	20.9863	20.9994	21.0000	20.9999	20.9922	20.8284	20.4516	20.1393 (87)
Th 2	20.0896	20.0914	20.0914	20.0939	20.0939	20.0971	20.0963	20.0978	20.0971	20.0955	20.0955	20.0931 (88)
util rest of house	0.9908	0.9786	0.9244	0.7459	0.4996	0.2762	0.1574	0.1818	0.4544	0.8470	0.9757	0.9932 (89)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF HEAT DEMAND 09 Jan 2014

MIT 2	19.0081	19.2345	19.6413	19.9878	20.0838	20.0968	20.0963	20.0978	20.0928	19.9226	19.4119	18.9578 (90)
Living area fraction									FLA =	Living area	/ (4) =	0.4468 (91)
MIT	19.5298	19.7249	20.0797	20.3926	20.4870	20.5000	20.5000	20.5008	20.4946	20.3273	19.8764	19.4857 (92)
Temperature adjustment												0.0000
adjusted MIT	19.5298	19.7249	20.0797	20.3926	20.4870	20.5000	20.5000	20.5008	20.4946	20.3273	19.8764	19.4857 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9890	0.9761	0.9242	0.7611	0.5257	0.3033	0.1863	0.2137	0.4899	0.8584	0.9737	0.9918 (94)
Useful gains	828.3500	949.1193	1076.0765	1089.2520	835.9340	506.8337	293.3141	304.1222	591.3237	830.6055	811.6730	778.9417 (95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Heat loss rate w	1641.3202	1603.1054	1439.0766	1187.1669	847.1021	507.2256	293.3306	304.1578	596.7885	985.5172	1341.1221	1629.2800 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kwh	604.8498	439.4786	270.0721	70.4987	8.3091	0.0000	0.0000	0.0000	0.0000	115.2543	381.2033	632.6517 (98)
Space heating												2522.3176 (98)
RHI space heating demand												2522 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	114.6000	2.4000	275.0400
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	114.6000		
Dwelling volume			275.0400

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) =	0.0727 (8)
Pressure test				Yes	
Measured/design AP50				4.0000	
Infiltration rate				0.2727 (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) =	0.2318 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	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	0.2956	0.2898	0.2840	0.2550	0.2492	0.2202	0.2202	0.2144	0.2318	0.2492	0.2608	0.2724 (22b)
	0.5437	0.5420	0.5403	0.5325	0.5310	0.5242	0.5242	0.5230	0.5269	0.5310	0.5340	0.5371 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.9500	1.0000	1.9500		(26)					
Window (Uw = 1.20)			19.3600	1.1450	22.1679		(27)					
roof ligh (Uw = 1.20)			6.1600	1.1450	7.0534		(27a)					
External Wall 1	57.3600	19.3600	38.0000	0.1800	6.8400		(29a)					
5.04	19.4400	1.9500	17.4900	0.1671	2.9220		(29a)					
External Roof 1	156.8000	6.1600	150.6400	0.1400	21.0896		(30)					
Total net area of external elements Aum(A, m2)			233.6000				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	62.0230		(33)					
Party Wall 1			42.0000	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							3.6516 (36)					
Total fabric heat loss						(33) + (36) =	65.6746 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 49.3459	Feb 49.1919	Mar 49.0410	Apr 48.3323	May 48.1997	Jun 47.5824	Jul 47.5824	Aug 47.4681	Sep 47.8202	Oct 48.1997	Nov 48.4680	Dec 48.7484 (38)
Heat transfer coeff	115.0205	114.8666	114.7157	114.0070	113.8744	113.2571	113.2571	113.1428	113.4949	113.8744	114.1426	114.4230 (39)
Average = Sum(39)m / 12 =												114.0063 (39)
HLP	Jan 1.0037	Feb 1.0023	Mar 1.0010	Apr 0.9948	May 0.9937	Jun 0.9883	Jul 0.9883	Aug 0.9873	Sep 0.9904	Oct 0.9937	Nov 0.9960	Dec 0.9985 (40)
HLP (average)												0.9948 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8398 (42)
Average daily hot water use (litres/day)												101.6452 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	111.8097	107.7439	103.6781	99.6123	95.5465	91.4807	91.4807	95.5465	99.6123	103.6781	107.7439	111.8097 (44)
Energy conte	165.8106	145.0190	149.6466	130.4655	125.1848	108.0249	100.1010	114.8673	116.2392	135.4656	147.8713	160.5787 (45)
Energy content (annual)										Total = Sum(45)m =		1599.2745 (45)
Distribution loss (46)m = 0.15 x (45)m												
24.8716	21.7528	22.4470	19.5698	18.7777	16.2037	15.0151	17.2301	17.4359	20.3198	22.1807	24.0868 (46)	
Water storage loss:												
Store volume												201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100 (48)

Regs Region: England
Elmhurst Energy Systems
SAP2012 Calculator (Design
System) version 4.14r19

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 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)
Fraction of main heating from main system 2													0.0000	(203)
Fraction of total heating from main system 1													1.0000	(204)
Fraction of total heating from main system 2													0.0000	(205)
Efficiency of main space heating system 1 (in %)													100.0000	(206)
Efficiency of main space heating system 2 (in %)													0.0000	(207)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													3039.2472	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	688.9602	500.1978	338.8776	114.9163	21.6719	0.0000	0.0000	0.0000	0.0000	184.4861	470.1784	719.9589	(98)	
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)	
Space heating fuel (main heating system)	688.9602	500.1978	338.8776	114.9163	21.6719	0.0000	0.0000	0.0000	0.0000	184.4861	470.1784	719.9589	(211)	
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)	
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)	
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)	
Space heating fuel used, main system 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)	
Water heating requirement	192.7620	169.3622	176.5980	156.5475	152.1362	134.1069	127.0524	141.8187	142.3212	162.4170	173.9533	187.5301	(64)	
Efficiency of water heater (217)m	348.9524	348.9524	348.9524	348.9524	348.9524	348.9524	348.9524	348.9524	348.9524	348.9524	348.9524	348.9524	(216)	
Fuel for water heating, kWh/month	55.2402	48.5345	50.6080	44.8621	43.5980	38.4313	36.4097	40.6413	40.7853	46.5442	49.8502	53.7409	(219)	
Water heating fuel used													(219)	
Annual totals kWh/year														
Space heating fuel - main system													3039.2472	(211)
Space heating fuel - secondary													0.0000	(215)
Electricity for pumps and fans:														
Total electricity for the above, kWh/year													0.0000	(231)
Electricity for lighting (calculated in Appendix L)													437.7015	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.00 * 1.70 * 1000 * 1.00) =										-1468.1535			-1468.1535	(233)
Total delivered energy for all uses													2558.0408	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kwh/year	Fuel price p/kwh	Fuel cost £/year	
Space heating - main system 1	3039.2472	13.1900	400.8767	(240)
Space heating - main system 2	0.0000	13.1900	0.0000	(241)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	549.2456	13.1900	72.4455	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Energy for lighting	437.7015	13.1900	57.7328	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit	-1468.1535	13.1900	-193.6494	(252)
Total energy cost			337.4056	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.4200	(256)
Energy cost factor (ECF)	0.8879	(257)
SAP value	87.6137	
SAP rating (Section 12)	88	(258)
SAP band	B	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3039.2472	0.5190	1577.3693	(261)
Space heating - main system 2	0.0000	0.5190	0.0000	(262)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	549.2456	0.5190	285.0585	(264)
Space and water heating			1862.4278	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	437.7015	0.5190	227.1671	(268)
Energy saving/generation technologies				
PV Unit	-1468.1535	0.5190	-761.9717	(269)
Total kg/year			1327.6232	(272)
CO2 emissions per m2			11.5800	(273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

EI value
EI rating
EI band

88.8533
89 (274)
B

----- Calculation of stars for heating and DHW

Main heating 1 energy efficiency	$13.19 \times (1 + 0.29 \times 0.00) / 1.0000 = 13.190$, stars = 1
Main heating 2 energy efficiency	(does water heating only)
Main heating 1 environmental impact	$0.519 \times (1 + 0.29 \times 0.00) / 1.0000 = 0.5190$, stars = 2
Main heating 2 environmental impact	(does water heating only)
Water heating energy efficiency	$13.19 / 3.4895 = 3.780$, stars = 5
Water heating environmental impact	$0.519 / 3.4895 = 0.1487$, stars = 5

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	114.6000 (1b)	2.4000 (2b)	275.0400 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	114.6000		275.0400 (4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 275.0400 (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) =	0.0727 (8)
Pressure test				Yes	
Measured/design AP50				4.0000	
Infiltration rate				0.2727 (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) =	0.2318 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate	0.2434	0.2318	0.2318	0.2144	0.2144	0.1912	0.1970	0.1854	0.1912	0.2028	0.2028	0.2202 (22b)
Effective ac	0.5296	0.5269	0.5269	0.5230	0.5230	0.5183	0.5194	0.5172	0.5183	0.5206	0.5206	0.5242 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.9500	1.0000	1.9500		(26)					
Window (Uw = 1.20)			19.3600	1.1450	22.1679		(27)					
roof ligh (Uw = 1.20)			6.1600	1.1450	7.0534		(27a)					
External Wall 1	57.3600	19.3600	38.0000	0.1800	6.8400		(29a)					
5.04	19.4400	1.9500	17.4900	0.1671	2.9220		(29a)					
External Roof 1	156.8000	6.1600	150.6400	0.1400	21.0896		(30)					
Total net area of external elements Aum(A, m2)			233.6000				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	62.0230		(33)					
Party Wall 1			42.0000	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							3.6516 (36)					
Total fabric heat loss						(33) + (36) =	65.6746 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	48.0702	47.8202	47.8202	47.4681	47.4681	47.0414	47.1435	46.9423	47.0414	47.2487	47.2487	47.5824 (38)
Heat transfer coeff	113.7448	113.4949	113.4949	113.1428	113.1428	112.7160	112.8181	112.6170	112.7160	112.9233	112.9233	113.2571 (39)
Average = Sum(39)m / 12 =												113.0826 (39)
HLP	Jan 0.9925	Feb 0.9904	Mar 0.9904	Apr 0.9873	May 0.9873	Jun 0.9836	Jul 0.9845	Aug 0.9827	Sep 0.9836	Oct 0.9854	Nov 0.9854	Dec 0.9883 (40)
HLP (average)												0.9868 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8398 (42)
Average daily hot water use (litres/day)												101.6452 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	111.8097	107.7439	103.6781	99.6123	95.5465	91.4807	91.4807	95.5465	99.6123	103.6781	107.7439	111.8097 (44)
Energy conte	165.8106	145.0190	149.6466	130.4655	125.1848	108.0249	100.1010	114.8673	116.2392	135.4656	147.8713	160.5787 (45)
Energy content (annual)										Total = Sum(45)m =		1599.2745 (45)
Distribution loss (46)m = 0.15 x (45)m												
24.8716	21.7528	22.4470	19.5698	18.7777	16.2037	15.0151	17.2301	17.4359	20.3198	22.1807	24.0868 (46)	
Water storage loss:												
Store volume												201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100 (48)

sees

Regs Region: England
Elmhurst Energy Systems
SAP2012 Calculator (Design
System) version 4.14r19

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 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)
Fraction of main heating from main system 2													0.0000	(203)
Fraction of total heating from main system 1													1.0000	(204)
Fraction of total heating from main system 2													0.0000	(205)
Efficiency of main space heating system 1 (in %)													100.0000	(206)
Efficiency of main space heating system 2 (in %)													0.0000	(207)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													2522.3176	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	604.8498	439.4786	270.0721	70.4987	8.3091	0.0000	0.0000	0.0000	0.0000	115.2543	381.2033	632.6517	(98)	
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)	
Space heating fuel (main heating system)	604.8498	439.4786	270.0721	70.4987	8.3091	0.0000	0.0000	0.0000	0.0000	115.2543	381.2033	632.6517	(211)	
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)	
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)	
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)	
Space heating fuel used, main system 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)	
Water heating requirement	192.7620	169.3622	176.5980	156.5475	152.1362	134.1069	127.0524	141.8187	142.3212	162.4170	173.9533	187.5301	(64)	
Efficiency of water heater (217)m	348.9524	348.9524	348.9524	348.9524	348.9524	348.9524	348.9524	348.9524	348.9524	348.9524	348.9524	348.9524	(216)	
Fuel for water heating, kWh/month	55.2402	48.5345	50.6080	44.8621	43.5980	38.4313	36.4097	40.6413	40.7853	46.5442	49.8502	53.7409	(219)	
Water heating fuel used												549.2456	(219)	
Annual totals kWh/year														
Space heating fuel - main system												2522.3176	(211)	
Space heating fuel - secondary												0.0000	(215)	
Electricity for pumps and fans:														
Total electricity for the above, kWh/year												0.0000	(231)	
Electricity for lighting (calculated in Appendix L)												437.7015	(232)	
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.00 * 1.70 * 1140 * 1.00) =										-1550.5357		-1550.5357	(233)	
Total delivered energy for all uses												1958.7290	(238)	

10a. Fuel costs - using BEDF prices (554)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2522.3176	25.0500	631.8406 (240)
Space heating - main system 2	0.0000	25.0500	0.0000 (241)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	549.2456	25.0500	137.5860 (247)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Energy for lighting	437.7015	25.0500	109.6442 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit	-1550.5357	25.0500	-388.4092 (252)
Total energy cost			490.6616 (255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2522.3176	0.5190	1309.0829 (261)
Space heating - main system 2	0.0000	0.5190	0.0000 (262)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	549.2456	0.5190	285.0585 (264)
Space and water heating			1594.1413 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	437.7015	0.5190	227.1671 (268)
Energy saving/generation technologies			
PV Unit	-1550.5357	0.5190	-804.7280 (269)
Total kg/year			1016.5804 (272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2522.3176	3.0700	7743.5151 (261)
Space heating - main system 2	0.0000	3.0700	0.0000 (262)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	549.2456	3.0700	1686.1840 (264)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

Space and water heating			9429.6991 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	437.7015	3.0700	1343.7435 (268)
Energy saving/generation technologies			
PV Unit	-1550.5357	3.0700	-4760.1446 (269)
Primary energy kWh/year			6013.2981 (272)
Primary energy kWh/m2/year			52.4721 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 88
Current environmental impact rating: B 89

(For testing purposes):	
A	Not considered
B	Not considered
C	Not considered
D	Not considered
E Low energy lighting	Already installed
F	Not considered
G	Not considered
H	Not considered
I	Not considered
J	Not considered
K	Not considered
M	Not considered
N Solar water heating	Not applicable
O	Not considered
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U Solar photovoltaic panels	Not applicable
A2	Not considered
A3	Not considered
T2	Not considered
W	Not considered
X	Not considered
Y	Not considered
J2	Not considered
Q2	Not considered
Z1	Not considered
Z2	Not considered
Z3	Not considered
Z4	Not considered
Z5	Not considered
V2 Wind turbine	Not applicable
L2	Not considered
Q3	Not considered
O3	Not considered

Recommended measures: (none) SAP change Cost change CO2 change

Recommended measures (none)	Typical annual savings	Energy efficiency	Environmental impact
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 88
Potential environmental impact rating: B 89

Fuel prices for cost data on this page from database revision number 554 TEST (31 Oct 2024)
Recommendation texts revision number 4.9c (22 Feb 2014)

Typical heating and lighting costs of this home (per year, Thames Valley):			
	Current	Potential	Saving
Electricity	£879	£879	£0
Space heating	£632	£632	£0
Water heating	£138	£138	£0
Lighting	£110	£110	£0
Generated (PV)	-£388	-£388	£0
Total cost of fuels	£491	£491	£0
Total cost of uses	£492	£492	£0
Delivered energy	17 kWh/m²	17 kWh/m²	0 kWh/m²
Carbon dioxide emissions	1.0 tonnes	1.0 tonnes	0.0 tonnes
CO2 emissions per m²	9 kg/m²	9 kg/m²	0 kg/m²
Primary energy	52 kWh/m²	52 kWh/m²	0 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	2455-06-Flat 15	Issued on Date	05/05/2025
Assessment Reference	015	Prop Type Ref	
Property			

SAP Rating	90 B	DER	16.68	TER	29.54
Environmental	91 B	% DER<TER	43.53		
CO ₂ Emissions (t/year)	0.49	DFEE	42.22	TFEE	53.05
General Requirements Compliance	Pass	% DFEE<TFEE	20.41		

Assessor Details	Mrs. Naomi Sadler, Sadler Energy & Environmental Services Ltd, Tel: 01962 718870, naomi.sadler@sadlerenergy.co.uk	Assessor ID	4611-0001
Client	RHB PARTNERSHIP LLP , RHB		

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	52.4000 (1b)	2.4000 (2b)	125.7600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4000		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 125.7600 (5)
Dwelling volume			

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) =	0.1590 (8)
Pressure test				Yes	
Measured/design AP50				4.0000	
Infiltration rate				0.3590 (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) =	0.3052 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate												
Effective ac	0.3204	0.3052	0.3052	0.2823	0.2823	0.2518	0.2594	0.2441	0.2518	0.2670	0.2670	0.2899 (22b)
	0.5513	0.5466	0.5466	0.5398	0.5398	0.5317	0.5336	0.5298	0.5317	0.5357	0.5357	0.5420 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.9500	1.0000	1.9500		(26)
Window (Uw = 1.20)			9.6800	1.1450	11.0840		(27)
roof ligh (Uw = 1.20)			3.0800	1.1450	3.5267		(27a)
External Wall 1	18.0000	9.6800	8.3200	0.1800	1.4976		(29a)
5.04	14.4000	1.9500	12.4500	0.1671	2.0800		(29a)
External Roof 1	100.4500	3.0800	97.3700	0.1400	13.6318		(30)
Total net area of external elements Aum(A, m ²)			132.8500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		33.7701		(33)
Party Wall 1			37.9200	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.2332 (36)
Total fabric heat loss						(33) + (36) =	38.0033 (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	22.8810	22.6830	22.6830	22.4039	22.4039	22.0657	22.1467	21.9872	22.0657	22.2300	22.2300	22.4945 (38)
Heat transfer coeff	60.8844	60.6863	60.6863	60.4073	60.4073	60.0691	60.1500	59.9906	60.0691	60.2334	60.2334	60.4979 (39)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF HEAT DEMAND 09 Jan 2014

Average = Sum(39)m / 12 = 60.3596 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1619	1.1581	1.1581	1.1528	1.1528	1.1464	1.1479	1.1449	1.1464	1.1495	1.1495	1.1545 (40)
HLP (average)												1.1519 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kwh/year)

Assumed occupancy 1.7609 (42)
Average daily hot water use (litres/day) 76.0207 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	83.6227	80.5819	77.5411	74.5003	71.4594	68.4186	68.4186	71.4594	74.5003	77.5411	80.5819	83.6227 (44)
Energy content (annual)	124.0101	108.4600	111.9210	97.5755	93.6260	80.7921	74.8658	85.9096	86.9356	101.3151	110.5933	120.0972 (45)
Distribution loss (46)m = 0.15 x (45)m	18.6015	16.2690	16.7882	14.6363	14.0439	12.1188	11.2299	12.8864	13.0403	15.1973	16.5890	18.0146 (46)
Water storage loss:												
Store volume												201.0000 (47)
a) If manufacturer declared loss factor is known (kwh/day):												1.6100 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8694 (55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (57)
Primary 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 (59)
Total heat required for water heating calculated for each month	150.9615	132.8032	138.8724	123.6575	120.5774	106.8741	101.8172	112.8610	113.0176	128.2665	136.6753	147.0486 (62)
Solar input	0.0000	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	150.9615	132.8032	138.8724	123.6575	120.5774	106.8741	101.8172	112.8610	113.0176	128.2665	136.6753	147.0486 (64)
RHI water heating demand												1513.4322 (64)
Heat gains from water heating, kwh/month	41.2334	36.0630	37.2137	32.4438	31.1306	26.8634	24.8929	28.5649	28.9061	33.6873	36.7723	39.9323 (65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabolic gains (Table 5), Watts	105.6522	105.6522	105.6522	105.6522	105.6522	105.6522	105.6522	105.6522	105.6522	105.6522	105.6522	105.6522 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	34.2034	30.3791	24.7060	18.7040	13.9815	11.8037	12.7544	16.5786	22.2518	28.2537	32.9763	35.1540 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	229.0495	231.4263	225.4368	212.6859	196.5901	181.4623	171.3561	168.9792	174.9687	187.7197	203.8155	218.9432 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.3261	47.3261	47.3261	47.3261	47.3261	47.3261	47.3261	47.3261	47.3261	47.3261	47.3261	47.3261 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348 (71)
Water heating gains (Table 5)	55.4212	53.6651	50.0185	45.0609	41.8423	37.3102	33.4582	38.3937	40.1473	45.2786	51.0726	53.6725 (72)
Total internal gains	401.2176	398.0141	382.7048	358.9943	334.9573	313.1198	300.1121	306.4951	319.9114	343.7955	370.4078	390.3132 (73)

6. Solar gains

[Jan]													
				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d	Gains W			
West				9.6800	22.3313	0.6300	0.7000		0.7700	66.0635	(80)		
North				3.0800	30.0000	0.6300	0.7000		1.0000	36.6736	(82)		
Solar gains	102.7370	184.7056	308.5670	474.8321	575.4739	634.2851	595.7829	517.3119	392.9600	236.4402	132.0636	83.1391	(83)
Total gains	503.9546	582.7196	691.2717	833.8263	910.4312	947.4049	895.8950	823.8070	712.8714	580.2357	502.4715	473.4523	(84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nll,m (see Table 9a)												
tau	59.7672	59.9623	59.9623	60.2392	60.2392	60.5784	60.4969	60.6577	60.5784	60.4132	60.4132	60.1490
alpha	4.9845	4.9975	4.9975	5.0159	5.0159	5.0386	5.0331	5.0438	5.0386	5.0275	5.0275	5.0099
util living area	0.9811	0.9623	0.9977	0.7319	0.5202	0.3164	0.2081	0.2329	0.4819	0.8237	0.9586	0.9852 (86)
MIT	20.1530	20.3310	20.6335	20.8921	20.9827	20.9989	20.9999	20.9998	20.9912	20.8418	20.4598	20.1127 (87)
Th 2	19.9506	19.9536	19.9536	19.9579	19.9579	19.9632	19.9619	19.9644	19.9632	19.9606	19.9606	19.9565 (88)
util rest of house	0.9752	0.9512	0.8710	0.6812	0.4565	0.2511	0.1384	0.1576	0.3989	0.7700	0.9442	0.9805 (89)
MIT 2	18.8696	19.1233	19.5349	19.8541	19.9455	19.9627	19.9619	19.9643	19.9586	19.8114	19.3148	18.8167 (90)
Living area fraction												0.5172 (91)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF HEAT DEMAND 09 Jan 2014

MIT	19.5333	19.7479	20.1031	20.3909	20.4819	20.4986	20.4987	20.4999	20.4927	20.3443	19.9070	19.4870 (92)
Temperature adjustment												0.0000
adjusted MIT	19.5333	19.7479	20.1031	20.3909	20.4819	20.4986	20.4987	20.4999	20.4927	20.3443	19.9070	19.4870 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9723	0.9487	0.8752	0.7030	0.4889	0.2849	0.1745	0.1966	0.4417	0.7913	0.9433	0.9778 (94)
Useful gains	490.0055	552.8042	605.0003	586.2116	445.0744	269.8784	156.2937	161.9312	314.8893	459.1282	473.9906	462.9614 (95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Heat loss rate w												
Month fracti	878.7628	858.5826	770.9029	633.7272	451.9619	270.2260	156.3134	161.9668	317.9247	526.7004	717.1982	870.3820 (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	289.2354	205.4831	123.4315	34.2112	5.1243	0.0000	0.0000	0.0000	0.0000	50.2737	175.1095	303.1210 (98)
RHI space heating demand												1185.9898 (98)
												1186 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	52.4000 (1b)	2.4000 (2b)	125.7600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4000		125.7600 (4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 125.7600 (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) =	0.1590 (8)
Pressure test				Yes	
Measured/design AP50				4.0000	
Infiltration rate				0.3590 (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) =	0.3052 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infiltr rate	0.3891	0.3815	0.3738	0.3357	0.3281	0.2899	0.2899	0.2823	0.3052	0.3281	0.3433	0.3586 (22b)
Effective ac	0.5757	0.5728	0.5699	0.5563	0.5538	0.5420	0.5420	0.5398	0.5466	0.5538	0.5589	0.5643 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.9500	1.0000	1.9500		(26)					
Window (Uw = 1.20)			9.6800	1.1450	11.0840		(27)					
roof ligh (Uw = 1.20)			3.0800	1.1450	3.5267		(27a)					
External Wall 1	18.0000	9.6800	8.3200	0.1800	1.4976		(29a)					
5.04	14.4000	1.9500	12.4500	0.1671	2.0800		(29a)					
External Roof 1	100.4500	3.0800	97.3700	0.1400	13.6318		(30)					
Total net area of external elements Aum(A, m2)			132.8500				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.7701		(33)					
Party Wall 1			37.9200	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.2332 (36)					
Total fabric heat loss						(33) + (36) =	38.0033 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	23.8920	23.7700	23.6504	23.0888	22.9837	22.4945	22.4945	22.4039	22.6830	22.9837	23.1963	23.4185 (38)
Heat transfer coeff	61.8954	61.7734	61.6538	61.0921	60.9871	60.4979	60.4979	60.4073	60.6863	60.9871	61.1996	61.4219 (39)
Average = Sum(39)m / 12 =												61.0916 (39)
HLP	Jan 1.1812	Feb 1.1789	Mar 1.1766	Apr 1.1659	May 1.1639	Jun 1.1545	Jul 1.1545	Aug 1.1528	Sep 1.1581	Oct 1.1639	Nov 1.1679	Dec 1.1722 (40)
HLP (average)												1.1659 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7609 (42)
Average daily hot water use (litres/day)												76.0207 (43)
Daily hot water use	83.6227	80.5819	77.5411	74.5003	71.4594	68.4186	68.4186	71.4594	74.5003	77.5411	80.5819	83.6227 (44)
Energy conte	124.0101	108.4600	111.9210	97.5755	93.6260	80.7921	74.8658	85.9096	86.9356	101.3151	110.5933	120.0972 (45)
Energy content (annual)										Total = Sum(45)m =		1196.1012 (45)
Distribution loss (46)m = 0.15 x (45)m	18.6015	16.2690	16.7882	14.6363	14.0439	12.1188	11.2299	12.8864	13.0403	15.1973	16.5890	18.0146 (46)
Water storage loss:												201.0000 (47)
Store volume												1.6100 (48)
a) If manufacturer declared loss factor is known (kWh/day):												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8694 (55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (57)
Primary 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 (59)
Total heat required for water heating calculated for each month	150.9615	132.8032	138.8724	123.6575	120.5774	106.8741	101.8172	112.8610	113.0176	128.2665	136.6753	147.0486 (62)
Solar input	0.0000	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	150.9615	132.8032	138.8724	123.6575	120.5774	106.8741	101.8172	112.8610	113.0176	128.2665	136.6753	147.0486 (64)
Heat gains from water heating, kWh/month	41.2334	36.0630	37.2137	32.4438	31.1306	26.8634	24.8929	28.5649	28.9061	33.6873	36.7723	39.9323 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	105.6522	105.6522	105.6522	105.6522	105.6522	105.6522	105.6522	105.6522	105.6522	105.6522	105.6522	105.6522 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	34.2034	30.3791	24.7060	18.7040	13.9815	11.8037	12.7544	16.5786	22.2518	28.2537	32.9763	35.1540 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	229.0495	231.4263	225.4368	212.6859	196.5901	181.4623	171.3561	168.9792	174.9687	187.7197	203.8155	218.9432 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.3261	47.3261	47.3261	47.3261	47.3261	47.3261	47.3261	47.3261	47.3261	47.3261	47.3261	47.3261 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348 (71)
Water heating gains (Table 5)	55.4212	53.6651	50.0185	45.0609	41.8423	37.3102	33.4582	38.3937	40.1473	45.2786	51.0726	53.6725 (72)
Total internal gains	401.2176	398.0141	382.7048	358.9943	334.9573	313.1198	300.1121	306.4951	319.9114	343.7955	370.4078	390.3132 (73)

6. Solar gains

[Jan]				Area m2	Solar Flux Table 6a W/m2		Specific data or Table 6b		Specific data or Table 6c		FF Table 6d		Access factor Table 6d		Gains W	
West				9.6800	19.6403		0.6300		0.7000		0.7700		0.7700		58.1025 (80)	
North				3.0800	26.0000		0.6300		0.7000		1.0000		1.0000		31.7838 (82)	
Solar gains	89.8862	179.6731	304.5384	456.3631	569.2768	586.9782	557.1058	472.0077	358.2836	215.5499	112.7878			73.4521 (83)		
Total gains	491.1038	577.6872	687.2432	815.3574	904.2341	900.0980	857.2179	778.5028	678.1950	559.3454	483.1957			463.7653 (84)		

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, n1,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	58.7910	58.9071	59.0213	59.5640	59.6666	60.1490	60.1490	60.2392	59.9623	59.6666	59.4593	59.2442
alpha	4.9194	4.9271	4.9348	4.9709	4.9778	5.0099	5.0099	5.0159	4.9975	4.9778	4.9640	4.9496
util living area	0.9863	0.9700	0.9201	0.7892	0.6028	0.4266	0.3099	0.3556	0.5950	0.8804	0.9730	0.9894 (86)
MIT	20.0211	20.2258	20.5333	20.8290	20.9605	20.9942	20.9991	20.9982	20.9727	20.7465	20.3202	19.9771 (87)
Th 2	19.9351	19.9369	19.9388	19.9474	19.9490	19.9565	19.9565	19.9579	19.9536	19.9490	19.9457	19.9423 (88)
util rest of house	0.9822	0.9613	0.8989	0.7454	0.5426	0.3586	0.2368	0.2758	0.5137	0.8406	0.9636	0.9861 (89)
MIT 2	18.6681	18.9614	19.3881	19.7717	19.9165	19.9533	19.9562	19.9573	19.9358	19.6872	19.1070	18.6100 (90)
Living area fraction	19.3678	19.6153	19.9803	20.3185	20.4564	20.4916	20.4956	20.4956	20.4721	20.2350	19.7345	19.3170 (92)
MIT	19.3678	19.6153	19.9803	20.3185	20.4564	20.4916	20.4956	20.4956	20.4721	20.2350	19.7345	19.3170 (93)
Temperature adjustment	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
adjusted MIT	19.3678	19.6153	19.9803	20.3185	20.4564	20.4916	20.4956	20.4956	20.4721	20.2350	19.7345	19.3170 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9794	0.9581	0.8998	0.7617	0.5722	0.3937	0.2746	0.3171	0.5549	0.8525	0.9613	0.9836 (94)
Useful gains	480.9634	553.4793	618.3952	621.0195	517.4210	354.3450	235.4081	246.8670	376.3079	476.8697	464.4956	456.1767 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	932.6298	909.0161	831.1138	697.5792	534.0276	356.4300	235.6732	247.4047	386.6964	587.6118	773.2240	928.5152 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	336.0397	238.9207	158.2626	55.1230	12.3553	0.0000	0.0000	0.0000	0.0000	82.3921	222.2844	351.4243 (98)
Space heating												1456.8022 (98)
Space heating per m2												27.8016 (99)
	(98) / (4) =											

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 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)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	1456.8022	(211)
Jan	Feb	Mar
Space heating requirement	238.9207	158.2626
Space heating efficiency (main heating system 1)	100.0000	100.0000
Space heating fuel (main heating system)	238.9207	158.2626
Space heating efficiency (main heating system 2)	0.0000	0.0000
Space heating fuel (main heating system 2)	0.0000	0.0000
Water heating requirement	0.0000	0.0000
Water heating fuel used, main system 2	0.0000	0.0000
Water heating requirement	132.8032	138.8724
Efficiency of water heater (217)m	349.4100	349.4100
Fuel for water heating, kWh/month	43.2047	39.7448
Water heating fuel used	38.0079	35.3904
Annual totals kWh/year	34.5089	30.5870
Space heating fuel - main system	29.1397	32.3004
Space heating fuel - secondary	32.3453	36.7094
Electricity for pumps and fans:		
Total electricity for the above, kWh/year		
Electricity for lighting (calculated in Appendix L)		
Energy saving/generation technologies (Appendices M ,N and Q)		
PV Unit 0 (0.00 * 1.00 * 1000 * 1.00) =	-863.6197	
Total delivered energy for all uses		

10a. Fuel costs - using Table 12 prices

	Fuel	Fuel price	Fuel cost
	kWh/year	p/kWh	£/year
Space heating - main system 1	1456.8022	13.1900	192.1522 (240)
Space heating - main system 2	0.0000	13.1900	0.0000 (241)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	433.1393	13.1900	57.1311 (247)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Energy for lighting	241.6170	13.1900	31.8693 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit	-863.6197	13.1900	-113.9114 (252)
Total energy cost			167.2411 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.4200 (256)
Energy cost factor (ECF)	0.7212 (257)
SAP value	89.9398
SAP rating (Section 12)	90 (258)
SAP band	B

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

	Energy	Emission factor	Emissions
	kWh/year	kg CO2/kWh	kg CO2/year
Space heating - main system 1	1456.8022	0.5190	756.0884 (261)
Space heating - main system 2	0.0000	0.5190	0.0000 (262)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	433.1393	0.5190	224.7993 (264)
Space and water heating			980.8797 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	241.6170	0.5190	125.3992 (268)
Energy saving/generation technologies			
PV Unit	-863.6197	0.5190	-448.2186 (269)
Total kg/year			658.0683 (272)
CO2 emissions per m2			12.5600 (273)
EI value			90.9466
EI rating			91 (274)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

EI band

B

Calculation of stars for heating and DHW

Main heating 1 energy efficiency	$13.19 \times (1 + 0.29 \times 0.00) / 1.0000 = 13.190$, stars = 1
Main heating 2 energy efficiency	(does water heating only)
Main heating 1 environmental impact	$0.519 \times (1 + 0.29 \times 0.00) / 1.0000 = 0.5190$, stars = 2
Main heating 2 environmental impact	(does water heating only)
Water heating energy efficiency	$13.19 / 3.4941 = 3.775$, stars = 5
Water heating environmental impact	$0.519 / 3.4941 = 0.1485$, stars = 5

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	52.4000	2.4000	125.7600
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4000		
Dwelling volume			

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) =	0.1590 (8)
Pressure test				Yes	
Measured/design AP50				4.0000	
Infiltration rate				0.3590	(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) =	0.3052 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate												
Effective ac	0.3204	0.3052	0.3052	0.2823	0.2823	0.2518	0.2594	0.2441	0.2518	0.2670	0.2670	0.2899 (22b)
	0.5513	0.5466	0.5466	0.5398	0.5398	0.5317	0.5336	0.5298	0.5317	0.5357	0.5357	0.5420 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.9500	1.0000	1.9500		(26)					
Window (Uw = 1.20)			9.6800	1.1450	11.0840		(27)					
roof ligh (Uw = 1.20)			3.0800	1.1450	3.5267		(27a)					
External Wall 1	18.0000	9.6800	8.3200	0.1800	1.4976		(29a)					
5.04	14.4000	1.9500	12.4500	0.1671	2.0800		(29a)					
External Roof 1	100.4500	3.0800	97.3700	0.1400	13.6318		(30)					
Total net area of external elements Aum(A, m2)			132.8500				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.7701		(33)					
Party Wall 1			37.9200	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.2332 (36)					
Total fabric heat loss						(33) + (36) =	38.0033 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 22.8810	Feb 22.6830	Mar 22.6830	Apr 22.4039	May 22.4039	Jun 22.0657	Jul 22.1467	Aug 21.9872	Sep 22.0657	Oct 22.2300	Nov 22.2300	Dec 22.4945 (38)
Heat transfer coeff	60.8844	60.6863	60.6863	60.4073	60.4073	60.0691	60.1500	59.9906	60.0691	60.2334	60.2334	60.4979 (39)
Average = Sum(39)m / 12 =												60.3596 (39)
HLP	Jan 1.1619	Feb 1.1581	Mar 1.1581	Apr 1.1528	May 1.1528	Jun 1.1464	Jul 1.1479	Aug 1.1449	Sep 1.1464	Oct 1.1495	Nov 1.1495	Dec 1.1545 (40)
HLP (average)												1.1519 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7609 (42)
Average daily hot water use (litres/day)												76.0207 (43)
Daily hot water use	83.6227	80.5819	77.5411	74.5003	71.4594	68.4186	68.4186	71.4594	74.5003	77.5411	80.5819	83.6227 (44)
Energy conte	124.0101	108.4600	111.9210	97.5755	93.6260	80.7921	74.8658	85.9096	86.9356	101.3151	110.5933	120.0972 (45)
Energy content (annual)										Total = Sum(45)m =		1196.1012 (45)
Distribution loss (46)m = 0.15 x (45)m												
	18.6015	16.2690	16.7882	14.6363	14.0439	12.1188	11.2299	12.8864	13.0403	15.1973	16.5890	18.0146 (46)
Water storage loss:												
Store volume												201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100 (48)

Regs Region: England
Elmhurst Energy Systems
SAP2012 Calculator (Design
System) version 4.14r19

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 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)
Fraction of main heating from main system 2													0.0000	(203)
Fraction of total heating from main system 1													1.0000	(204)
Fraction of total heating from main system 2													0.0000	(205)
Efficiency of main space heating system 1 (in %)													100.0000	(206)
Efficiency of main space heating system 2 (in %)													0.0000	(207)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													1185.9898	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	289.2354	205.4831	123.4315	34.2112	5.1243	0.0000	0.0000	0.0000	0.0000	50.2737	175.1095	303.1210	(98)	
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)	
Space heating fuel (main heating system)	289.2354	205.4831	123.4315	34.2112	5.1243	0.0000	0.0000	0.0000	0.0000	50.2737	175.1095	303.1210	(211)	
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)	
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)	
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)	
Space heating fuel used, main system 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)	
Water heating requirement	150.9615	132.8032	138.8724	123.6575	120.5774	106.8741	101.8172	112.8610	113.0176	128.2665	136.6753	147.0486	(64)	
Efficiency of water heater (217)m	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	(216)	
Fuel for water heating, kWh/month	43.2047	38.0079	39.7448	35.3904	34.5089	30.5870	29.1397	32.3004	32.3453	36.7094	39.1160	42.0848	(219)	
Water heating fuel used												433.1393	(219)	
Annual totals kWh/year														
Space heating fuel - main system												1185.9898	(211)	
Space heating fuel - secondary													0.0000	(215)
Electricity for pumps and fans:														
Total electricity for the above, kWh/year													0.0000	(231)
Electricity for lighting (calculated in Appendix L)													241.6170	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.00 * 1.00 * 1140 * 1.00) =													-912.0798	(233)
Total delivered energy for all uses													948.6663	(238)

10a. Fuel costs - using BEDF prices (554)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1185.9898	25.0500	297.0904 (240)
Space heating - main system 2	0.0000	25.0500	0.0000 (241)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	433.1393	25.0500	108.5014 (247)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Energy for lighting	241.6170	25.0500	60.5250 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit	-912.0798	25.0500	-228.4760 (252)
Total energy cost			237.6409 (255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1185.9898	0.5190	615.5287 (261)
Space heating - main system 2	0.0000	0.5190	0.0000 (262)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	433.1393	0.5190	224.7993 (264)
Space and water heating			840.3280 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	241.6170	0.5190	125.3992 (268)
Energy saving/generation technologies			
PV Unit	-912.0798	0.5190	-473.3694 (269)
Total kg/year			492.3578 (272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1185.9898	3.0700	3640.9887 (261)
Space heating - main system 2	0.0000	3.0700	0.0000 (262)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	433.1393	3.0700	1329.7378 (264)
Space and water heating			4970.7265 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

Energy for lighting	241.6170	3.0700	741.7641 (268)
Energy saving/generation technologies			
PV Unit	-912.0798	3.0700	-2800.0850 (269)
Primary energy kwh/year			2912.4055 (272)
Primary energy kwh/m2/year			55.5803 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 90
Current environmental impact rating: B 91

(For testing purposes):	
A	Not considered
B	Not considered
C	Not considered
D	Not considered
E Low energy lighting	Already installed
F	Not considered
G	Not considered
H	Not considered
I	Not considered
J	Not considered
K	Not considered
M	Not considered
N Solar water heating	Not applicable
O	Not considered
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U Solar photovoltaic panels	Not applicable
A2	Not considered
A3	Not considered
T2	Not considered
W	Not considered
X	Not considered
Y	Not considered
J2	Not considered
Q2	Not considered
Z1	Not considered
Z2	Not considered
Z3	Not considered
Z4	Not considered
Z5	Not considered
V2 Wind turbine	Not applicable
L2	Not considered
Q3	Not considered
O3	Not considered

Recommended measures: (none) SAP change Cost change CO2 change

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 90
Potential environmental impact rating: B 91

Fuel prices for cost data on this page from database revision number 554 TEST (31 Oct 2024)
Recommendation texts revision number 4.9c (22 Feb 2014)

Typical heating and lighting costs of this home (per year, Thames Valley):			
	Current	Potential	Saving
Electricity	£466	£466	£0
Space heating	£297	£297	£0
Water heating	£109	£109	£0
Lighting	£61	£61	£0
Generated (PV)	-£228	-£228	£0
Total cost of fuels	£238	£238	£0
Total cost of uses	£239	£239	£0
Delivered energy	18 kWh/m²	18 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.5 tonnes	0.5 tonnes	0.0 tonnes
CO2 emissions per m²	9 kg/m²	9 kg/m²	0 kg/m²
Primary energy	56 kWh/m²	56 kWh/m²	0 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	2455-06-Flat 16	Issued on Date	02/05/2025
Assessment Reference	016	Prop Type Ref	
Property			

SAP Rating	90 B	DER	15.39	TER	26.60
Environmental	91 B	% DER<TER	42.15		
CO ₂ Emissions (t/year)	0.57	DFEE	37.09	TFEE	48.54
General Requirements Compliance	Pass	% DFEE<TFEE	23.58		

Assessor Details	Mrs. Naomi Sadler, Sadler Energy & Environmental Services Ltd, Tel: 01962 718870, naomi.sadler@sadlerenergy.co.uk	Assessor ID	4611-0001
Client	RHB PARTNERSHIP LLP , RHB		

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	65.4000 (1b)	2.4000 (2b)	156.9600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.4000		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 156.9600 (5)
Dwelling volume			

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				1 * 10 =	10.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				10.0000 / (5) =	0.0637 (8)
Pressure test				Yes	
Measured/design AP50				4.0000	
Infiltration rate				0.2637 (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) =	0.2242 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate	0.2354	0.2242	0.2242	0.2073	0.2073	0.1849	0.1905	0.1793	0.1849	0.1961	0.1961	0.2129 (22b)
Effective ac	0.5277	0.5251	0.5251	0.5215	0.5215	0.5171	0.5182	0.5161	0.5171	0.5192	0.5192	0.5227 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.9500	1.0000	1.9500		(26)
Window (Uw = 1.20)			11.2100	1.1450	12.8359		(27)
roof ligh (Uw = 1.20)			1.5400	1.1450	1.7634		(27a)
External Wall 1	44.9200	11.2100	33.7100	0.1800	6.0678		(29a)
5.04	16.0400	1.9500	14.0900	0.1671	2.3540		(29a)
External Roof 1	71.7900	1.5400	70.2500	0.1400	9.8350		(30)
External Roof 2	1.0000		1.0000	0.1400	0.1400		(30)
Total net area of external elements Aum(A, m ²)			133.7500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		34.9460		(33)
Party Wall 1			20.6400	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							3.2965 (36)
Total fabric heat loss						(33) + (36) =	38.2425 (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	27.3330	27.1997	27.1997	27.0118	27.0118	26.7841	26.8386	26.7312	26.7841	26.8947	26.8947	27.0728 (38)
Heat transfer coeff												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF HEAT DEMAND 09 Jan 2014

Average = Sum(39)m / 12 =	65.5755	65.4422	65.4422	65.2543	65.2543	65.0266	65.0811	64.9737	65.0266	65.1372	65.1372	65.3153 (39)
												65.2222 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0027	1.0006	1.0006	0.9978	0.9978	0.9943	0.9951	0.9935	0.9943	0.9960	0.9960	0.9987 (40)
Days in month												0.9973 (40)
	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kwh/year)

Assumed occupancy												2.1295 (42)
Average daily hot water use (litres/day)												84.7756 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	93.2531	89.8621	86.4711	83.0801	79.6890	76.2980	76.2980	79.6890	83.0801	86.4711	89.8621	93.2531 (44)
Energy content	138.2917	120.9508	124.8104	108.8127	104.4084	90.0965	90.0965	95.8033	96.9475	112.9830	123.3298	133.9281 (45)
Energy content (annual)												1333.8499 (45)
Distribution loss (46)m = 0.15 x (45)m												
	20.7438	18.1426	18.7216	16.3219	15.6613	13.5145	12.5231	14.3705	14.5421	16.9474	18.4995	20.0892 (46)
Water storage loss:												
Store volume												201.0000 (47)
a) If manufacturer declared loss factor is known (kwh/day):												1.6100 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8694 (55)
Total storage loss												
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)
If cylinder contains dedicated solar storage												
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (57)
Primary 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 (59)
Total heat required for water heating calculated for each month												
	165.2431	145.2940	151.7618	134.8947	131.3598	116.1785	110.4391	122.7547	123.0295	139.9344	149.4118	160.8795 (62)
Solar input	0.0000	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												
	165.2431	145.2940	151.7618	134.8947	131.3598	116.1785	110.4391	122.7547	123.0295	139.9344	149.4118	160.8795 (64)
RHI water heating demand												
Heat gains from water heating, kwh/month												
	45.9820	40.2161	41.4995	36.1802	34.7158	29.9571	27.7596	31.8546	32.2350	37.5668	41.0071	44.5311 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	127.7699	127.7699	127.7699	127.7699	127.7699	127.7699	127.7699	127.7699	127.7699	127.7699	127.7699	127.7699 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	41.8266	37.1500	30.2124	22.8728	17.0977	14.4346	15.5971	20.2736	27.2112	34.5509	40.3260	42.9891 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	278.1083	280.9942	273.7218	258.2398	238.6966	220.3287	208.0578	205.1719	212.4443	227.9263	247.4695	265.8374 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	49.9065	49.9065	49.9065	49.9065	49.9065	49.9065	49.9065	49.9065	49.9065	49.9065	49.9065	49.9065 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
	-85.1799	-85.1799	-85.1799	-85.1799	-85.1799	-85.1799	-85.1799	-85.1799	-85.1799	-85.1799	-85.1799	-85.1799 (71)
Water heating gains (Table 5)												
	61.8038	59.8455	55.7788	50.2503	46.6610	41.6071	37.3114	42.8153	44.7709	50.4931	56.9544	59.8536 (72)
Total internal gains												
	474.2351	470.4861	452.2095	423.8593	394.9517	368.8668	353.4627	360.7573	376.9229	405.4667	437.2463	461.1766 (73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains
	m2	Table 6a	Specific data	Specific data	factor	W
		W/m2	or Table 6b	or Table 6c	Table 6d	
East	1.5300	22.3313	0.6300	0.7000	0.7700	10.4419 (76)
West	9.6800	22.3313	0.6300	0.7000	0.7700	66.0635 (80)
North	1.5400	30.0000	0.6300	0.7000	1.0000	18.3368 (82)
Solar gains	94.8421	168.8509	278.5029	423.5853	509.5655	559.9744
Total gains	569.0772	639.3370	730.7124	847.4446	904.5172	928.8412

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, n1,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	69.2585	69.3997	69.3997	69.5995	69.5995	69.8432	69.7848	69.9001	69.8432	69.7246	69.7246	69.5345
alpha	5.6172	5.6266	5.6266	5.6400	5.6400	5.6562	5.6523	5.6600	5.6562	5.6483	5.6483	5.6356
util living area												
	0.9846	0.9703	0.9191	0.7756	0.5659	0.3494	0.2292	0.2533	0.5107	0.8438	0.9653	0.9880 (86)
MIT	20.2882	20.4280	20.6776	20.9010	20.9849	20.9992	20.9999	20.9999	20.9935	20.8690	20.5459	20.2516 (87)
Th 2	20.0811	20.0828	20.0828	20.0852	20.0852	20.0881	20.0874	20.0888	20.0881	20.0867	20.0867	20.0844 (88)
util rest of house												
	0.9799	0.9617	0.8975	0.7306	0.5054	0.2860	0.1617	0.1812	0.4333	0.7964	0.9534	0.9842 (89)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF HEAT DEMAND 09 Jan 2014

MIT 2	19.1630	19.3629	19.7063	19.9868	20.0740	20.0877	20.0874	20.0888	20.0846	19.9599	19.5359	19.1132 (90)
Living area fraction									fLA =	Living area	/ (4) =	0.4709 (91)
MIT	19.6930	19.8645	20.1637	20.4173	20.5030	20.5170	20.5172	20.5179	20.5126	20.3881	20.0115	19.6493 (92)
Temperature adjustment												0.0000
adjusted MIT	19.6930	19.8645	20.1637	20.4173	20.5030	20.5170	20.5172	20.5179	20.5126	20.3881	20.0115	19.6493 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9774	0.9592	0.8997	0.7476	0.5334	0.3159	0.1935	0.2151	0.4697	0.8133	0.9522	0.9820 (94)
Useful gains	556.2172	613.2667	657.3908	633.5870	482.4340	293.4254	170.3145	176.5660	342.7961	504.6781	532.0972	528.4571 (95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Heat loss rate w												
	956.9409	933.5016	835.2850	686.3010	489.6013	293.7239	170.3273	176.5892	345.4609	572.4305	782.3968	950.2918 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kwh												
	298.1384	215.1979	132.3532	37.9540	5.3324	0.0000	0.0000	0.0000	0.0000	50.4078	180.2157	313.8450 (98)
Space heating												1233.4446 (98)
RHI space heating demand												1233 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	65.4000 (1b)	2.4000 (2b)	156.9600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.4000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	156.9600 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				1 * 10 =	10.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				10.0000 / (5) = 0.0637 (8)
Pressure test					Yes
Measured/design AP50					4.0000
Infiltration rate					0.2637 (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) =				0.2242 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infiltr rate	0.2850	0.2802	0.2746	0.2466	0.2410	0.2129	0.2129	0.2073	0.2242	0.2410	0.2522	0.2634 (22b)
Effective ac	0.5408	0.5393	0.5377	0.5304	0.5290	0.5227	0.5227	0.5215	0.5251	0.5290	0.5318	0.5347 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Door			1.9500	1.0000	1.9500		(26)
Window (Uw = 1.20)			11.2100	1.1450	12.8359		(27)
roof ligh (Uw = 1.20)			1.5400	1.1450	1.7634		(27a)
External Wall 1	44.9200	11.2100	33.7100	0.1800	6.0678		(29a)
5.04	16.0400	1.9500	14.0900	0.1671	2.3540		(29a)
External Roof 1	71.7900	1.5400	70.2500	0.1400	9.8350		(30)
External Roof 2	1.0000		1.0000	0.1400	0.1400		(30)
Total net area of external elements Aum(A, m2)			133.7500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.9460		(33)
Party Wall 1			20.6400	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							3.2965 (36)
Total fabric heat loss						(33) + (36) =	38.2425 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	Jan 28.0138	Feb 27.9316	Mar 27.8511	Apr 27.4729	May 27.4022	Jun 27.0728	Jul 27.0728
Heat transfer coeff	66.2563	66.1741	66.0936	65.7154	65.6447	65.3153	65.3153
Average = Sum(39)m / 12 =							
	Jan 1.0131	Feb 1.0118	Mar 1.0106	Apr 1.0048	May 1.0037	Jun 0.9987	Jul 0.9987
HLP							
HLP (average)							
Days in month	31	28	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1295 (42)
Average daily hot water use (litres/day)												84.7756 (43)
Daily hot water use	Jan 93.2531	Feb 89.8621	Mar 86.4711	Apr 83.0801	May 79.6890	Jun 76.2980	Jul 76.2980	Aug 79.6890	Sep 83.0801	Oct 86.4711	Nov 89.8621	Dec 93.2531 (44)
Energy conte	138.2917	120.9508	124.8104	108.8127	104.4084	90.0965	83.4877	95.8033	96.9475	112.9830	123.3298	133.9281 (45)
Energy content (annual)												Total = Sum(45)m = 1333.8499 (45)
Distribution loss (46)m = 0.15 x (45)m	20.7438	18.1426	18.7216	16.3219	15.6613	13.5145	12.5231	14.3705	14.5421	16.9474	18.4995	20.0892 (46)
Water storage loss:												201.0000 (47)
Store volume												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

a) If manufacturer declared loss factor is known (kWh/day):													1.6100 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.8694 (55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary 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	(59)
Total heat required for water heating calculated for each month	165.2431	145.2940	151.7618	134.8947	131.3598	116.1785	110.4391	122.7547	123.0295	139.9344	149.4118	160.8795	(62)
Solar input	0.0000	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	165.2431	145.2940	151.7618	134.8947	131.3598	116.1785	110.4391	122.7547	123.0295	139.9344	149.4118	160.8795	(64)
Heat gains from water heating, kWh/month	45.9820	40.2161	41.4995	36.1802	34.7158	29.9571	27.7596	31.8546	32.2350	37.5668	41.0071	44.5311	(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	127.7699	127.7699	127.7699	127.7699	127.7699	127.7699	127.7699	127.7699	127.7699	127.7699	127.7699	127.7699	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	41.8266	37.1500	30.2124	22.8728	17.0977	14.4346	15.5971	20.2736	27.2112	34.5509	40.3260	42.9891	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	278.1083	280.9942	273.7218	258.2398	238.6966	220.3287	208.0578	205.1719	212.4443	227.9263	247.4695	265.8374	(68)
Pumps, fans	49.9065	49.9065	49.9065	49.9065	49.9065	49.9065	49.9065	49.9065	49.9065	49.9065	49.9065	49.9065	(69)
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Water heating gains (Table 5)	-85.1799	-85.1799	-85.1799	-85.1799	-85.1799	-85.1799	-85.1799	-85.1799	-85.1799	-85.1799	-85.1799	-85.1799	(71)
Total internal gains	61.8038	59.8455	55.7788	50.2503	46.6610	41.6071	37.3114	42.8153	44.7709	50.4931	56.9544	59.8536	(72)
	474.2351	470.4861	452.2095	423.8593	394.9517	368.8668	353.4627	360.7573	376.9229	405.4667	437.2463	461.1766	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	Specific data g or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W				
East				1.5300	19.6403	0.6300	0.7000	0.7700	9.1835 (76)				
West				9.6800	19.6403	0.6300	0.7000	0.7700	58.1025 (80)				
North				1.5400	26.0000	0.6300	0.7000	1.0000	15.8919 (82)				
Solar gains	83.1779	164.6319	275.4465	407.8282	504.8022	518.8659	493.1208	420.3145	322.4021	196.5259	104.0682	68.1685	(83)
Total gains	557.4130	635.1180	727.6560	831.6876	899.7538	887.7327	846.5835	781.0719	699.3249	601.9926	541.3145	529.3451	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, n11,m (see Table 9a)													
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
alpha	68.5470	68.6321	68.7157	69.1111	69.1856	69.5345	69.5345	69.5995	69.3997	69.1856	69.0351	68.8784	
util living area	5.5698	5.5755	5.5810	5.6074	5.6124	5.6356	5.6356	5.6400	5.6266	5.6124	5.6023	5.5919	
	0.9890	0.9766	0.9381	0.8290	0.6517	0.4673	0.3390	0.3832	0.6250	0.8967	0.9777	0.9915	(86)
MIT	20.1823	20.3443	20.5937	20.8441	20.9644	20.9953	20.9994	20.9988	20.9787	20.7892	20.4319	20.1408	(87)
Th 2	20.0724	20.0735	20.0745	20.0793	20.0802	20.0844	20.0844	20.0852	20.0828	20.0802	20.0784	20.0765	(88)
util rest of house	0.9857	0.9699	0.9215	0.7914	0.5958	0.4021	0.2687	0.3076	0.5502	0.8625	0.9700	0.9890	(89)
MIT 2	19.0034	19.2362	19.5854	19.9142	20.0498	20.0816	20.0842	20.0847	20.0682	19.8574	19.3684	18.9466	(90)
Living area fraction									fLA = Living area / (4)			0.4709	(91)
MIT	19.5586	19.7581	20.0603	20.3521	20.4806	20.5119	20.5152	20.5152	20.4970	20.2962	19.8692	19.5090	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5586	19.7581	20.0603	20.3521	20.4806	20.5119	20.5152	20.5152	20.4970	20.2962	19.8692	19.5090	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9834	0.9672	0.9212	0.8032	0.6207	0.4327	0.3018	0.3433	0.5848	0.8714	0.9679	0.9869	(94)
Ext temp.	548.1511	614.2748	670.3297	668.0263	558.4369	384.1290	255.5121	268.1057	408.9454	524.5655	523.9479	522.4337	(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	1010.9794	993.2188	896.2473	752.5815	576.3972	386.1383	255.7218	268.5335	418.6338	636.5055	840.0599	1009.4346	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating per m2	344.3442	247.9303	168.0827	60.8797	13.3624	0.0000	0.0000	0.0000	0.0000	83.2834	227.6006	362.3286	(98)
										(98) / (4) =		23.0552	(99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 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)
Fraction of main heating from main system 2													0.0000 (203)
Fraction of total heating from main system 1													1.0000 (204)
Fraction of total heating from main system 2													0.0000 (205)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1507.8121 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	344.3442	247.9303	168.0827	60.8797	13.3624	0.0000	0.0000	0.0000	0.0000	83.2834	227.6006	362.3286	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	344.3442	247.9303	168.0827	60.8797	13.3624	0.0000	0.0000	0.0000	0.0000	83.2834	227.6006	362.3286	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Water heating requirement	165.2431	145.2940	151.7618	134.8947	131.3598	116.1785	110.4391	122.7547	123.0295	139.9344	149.4118	160.8795	(64)
Efficiency of water heater (217)m	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	(216)
Fuel for water heating, kWh/month	47.2920	41.5827	43.4337	38.6064	37.5947	33.2499	31.6073	35.1320	35.2106	40.0488	42.7612	46.0432	(219)
Water heating fuel used												472.5626	(219)
Annual totals kWh/year													
Space heating fuel - main system												1507.8121	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												295.4685	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.00 * 1.00 * 1000 * 1.00) =										-863.6197		-863.6197	(233)
Total delivered energy for all uses												1412.2235	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1507.8121	13.1900	198.8804 (240)
Space heating - main system 2	0.0000	13.1900	0.0000 (241)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	472.5626	13.1900	62.3310 (247)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Energy for lighting	295.4685	13.1900	38.9723 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit	-863.6197	13.1900	-113.9114 (252)
Total energy cost			186.2723 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.4200 (256)
Energy cost factor (ECF)	0.7086 (257)
SAP value	90.1144
SAP rating (Section 12)	90 (258)
SAP band	B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1507.8121	0.5190	782.5545 (261)
Space heating - main system 2	0.0000	0.5190	0.0000 (262)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	472.5626	0.5190	245.2600 (264)
Space and water heating			1027.8145 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	295.4685	0.5190	153.3481 (268)
Energy saving/generation technologies			
PV Unit	-863.6197	0.5190	-448.2186 (269)
Total kg/year			732.9440 (272)
CO2 emissions per m2			11.2100 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

EI value
EI rating
EI band

91.1038
91 (274)
B

Calculation of stars for heating and DHW

Main heating 1 energy efficiency	$13.19 \times (1 + 0.29 \times 0.00) / 1.0000 = 13.190$, stars = 1
Main heating 2 energy efficiency	(does water heating only)
Main heating 1 environmental impact	$0.519 \times (1 + 0.29 \times 0.00) / 1.0000 = 0.5190$, stars = 2
Main heating 2 environmental impact	(does water heating only)
Water heating energy efficiency	$13.19 / 3.4941 = 3.775$, stars = 5
Water heating environmental impact	$0.519 / 3.4941 = 0.1485$, stars = 5

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	65.4000 (1b)	x 2.4000 (2b)	= 156.9600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.4000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 156.9600 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				1 * 10 =	10.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				10.0000 / (5) = 0.0637 (8)
Pressure test					Yes
Measured/design AP50					4.0000
Infiltration rate					0.2637 (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) =				0.2242 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infiltr rate	0.2354	0.2242	0.2242	0.2073	0.2073	0.1849	0.1905	0.1793	0.1849	0.1961	0.1961	0.2129 (22b)
Effective ac	0.5277	0.5251	0.5251	0.5215	0.5215	0.5171	0.5182	0.5161	0.5171	0.5192	0.5192	0.5227 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.9500	1.0000	1.9500		(26)
Window (Uw = 1.20)			11.2100	1.1450	12.8359		(27)
roof ligh (Uw = 1.20)			1.5400	1.1450	1.7634		(27a)
External Wall 1	44.9200	11.2100	33.7100	0.1800	6.0678		(29a)
5.04	16.0400	1.9500	14.0900	0.1671	2.3540		(29a)
External Roof 1	71.7900	1.5400	70.2500	0.1400	9.8350		(30)
External Roof 2	1.0000		1.0000	0.1400	0.1400		(30)
Total net area of external elements Aum(A, m ²)			133.7500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.9460		(33)
Party Wall 1			20.6400	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							3.2965 (36)
Total fabric heat loss						(33) + (36) =	38.2425 (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	27.3330	27.1997	27.1997	27.0118	27.0118	26.7841	26.8386	26.7312	26.7841	26.8947	26.8947	27.0728 (38)
Heat transfer coeff	65.5755	65.4422	65.4422	65.2543	65.2543	65.0266	65.0811	64.9737	65.0266	65.1372	65.1372	65.3153 (39)
Average = Sum(39)m / 12 =												65.2222 (39)
HLP	1.0027	1.0006	1.0006	0.9978	0.9978	0.9943	0.9951	0.9935	0.9943	0.9960	0.9960	0.9987 (40)
HLP (average)												0.9973 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1295 (42)
Average daily hot water use (litres/day)												84.7756 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	93.2531	89.8621	86.4711	83.0801	79.6890	76.2980	76.2980	79.6890	83.0801	86.4711	89.8621	93.2531 (44)
Energy conte	138.2917	120.9508	124.8104	108.8127	104.4084	90.0965	83.4877	95.8033	96.9475	112.9830	123.3298	133.9281 (45)
Energy content (annual)												
Distribution loss (46)m = 0.15 x (45)m												1333.8499 (45)
	20.7438	18.1426	18.7216	16.3219	15.6613	13.5145	12.5231	14.3705	14.5421	16.9474	18.4995	20.0892 (46)
Water storage loss:												
Store volume												201.0000 (47)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

a) If manufacturer declared loss factor is known (kWh/day):	1.6100 (48)
Temperature factor from Table 2b	0.5400 (49)
Enter (49) or (54) in (55)	0.8694 (55)
Total storage loss	
26.9514 24.3432 26.9514 26.0820 26.9514 26.0820 26.9514 26.9514 26.0820 26.9514 26.0820 26.9514 (56)	
If cylinder contains dedicated solar storage	
26.9514 24.3432 26.9514 26.0820 26.9514 26.0820 26.9514 26.9514 26.0820 26.9514 26.0820 26.9514 (57)	
Primary 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 (59)
Total heat required for water heating calculated for each month	
165.2431 145.2940 151.7618 134.8947 131.3598 116.1785 110.4391 122.7547 123.0295 139.9344 149.4118 160.8795 (62)	
Solar input	0.0000 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	
165.2431 145.2940 151.7618 134.8947 131.3598 116.1785 110.4391 122.7547 123.0295 139.9344 149.4118 160.8795 (64)	
Heat gains from water heating, kWh/month	
45.9820 40.2161 41.4995 36.1802 34.7158 29.9571 27.7596 31.8546 32.2350 37.5668 41.0071 44.5311 (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	127.7699	127.7699	127.7699	127.7699	127.7699	127.7699	127.7699	127.7699	127.7699	127.7699	127.7699	127.7699 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	41.8266	37.1500	30.2124	22.8728	17.0977	14.4346	15.5971	20.2736	27.2112	34.5509	40.3260	42.9891 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	278.1083	280.9942	273.7218	258.2398	238.6966	220.3287	208.0578	205.1719	212.4443	227.9263	247.4695	265.8374 (68)
Pumps, fans	49.9065	49.9065	49.9065	49.9065	49.9065	49.9065	49.9065	49.9065	49.9065	49.9065	49.9065	49.9065 (69)
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Water heating gains (Table 5)	-85.1799	-85.1799	-85.1799	-85.1799	-85.1799	-85.1799	-85.1799	-85.1799	-85.1799	-85.1799	-85.1799	-85.1799 (71)
Total internal gains	61.8038	59.8455	55.7788	50.2503	46.6610	41.6071	37.3114	42.8153	44.7709	50.4931	56.9544	59.8536 (72)
	474.2351	470.4861	452.2095	423.8593	394.9517	368.8668	353.4627	360.7573	376.9229	405.4667	437.2463	461.1766 (73)

6. Solar gains

[Jan]			Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W				
East			1.5300	22.3313	0.6300	0.7000	0.7700	10.4419 (76)				
West			9.6800	22.3313	0.6300	0.7000	0.7700	66.0635 (80)				
North			1.5400	30.0000	0.6300	0.7000	1.0000	18.3368 (82)				
Solar gains	94.8421	168.8509	278.5029	423.5853	559.9744	526.6489	352.9060	215.0871	121.5640	76.9732 (83)		
Total gains	569.0772	639.3370	730.7124	847.4446	904.5172	928.8412	880.1116	820.6656	729.8289	620.5538	558.8103	538.1498 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, n11,m (see Table 9a)													
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
alpha	69.2585	69.3997	69.3997	69.5995	69.5995	69.8432	69.7848	69.9001	69.8432	69.7246	69.7246	69.5345	
util living area	5.6172	5.6266	5.6266	5.6400	5.6400	5.6562	5.6523	5.6600	5.6562	5.6483	5.6483	5.6356	
	0.9846	0.9703	0.9191	0.7756	0.5659	0.3494	0.2292	0.2533	0.5107	0.8438	0.9653	0.9880 (86)	
MIT	20.2882	20.4280	20.6776	20.9010	20.9849	20.9992	20.9999	20.9999	20.9935	20.8690	20.5459	20.2516 (87)	
Th 2	20.0811	20.0828	20.0828	20.0852	20.0852	20.0881	20.0874	20.0888	20.0881	20.0867	20.0867	20.0844 (88)	
util rest of house													
	0.9799	0.9617	0.8975	0.7306	0.5054	0.2860	0.1617	0.1812	0.4333	0.7964	0.9534	0.9842 (89)	
MIT 2	19.1630	19.3629	19.7063	19.9868	20.0740	20.0877	20.0874	20.0888	20.0846	19.9599	19.5359	19.1132 (90)	
Living area fraction									fLA = Living area / (4) =			0.4709 (91)	
MIT	19.6930	19.8645	20.1637	20.4173	20.5030	20.5170	20.5172	20.5179	20.5126	20.3881	20.0115	19.6493 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.6930	19.8645	20.1637	20.4173	20.5030	20.5170	20.5172	20.5179	20.5126	20.3881	20.0115	19.6493 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9774	0.9592	0.8997	0.7476	0.5334	0.3159	0.1935	0.2151	0.4697	0.8133	0.9522	0.9820 (94)	
Ext temp.	556.2172	613.2667	657.3908	633.5870	482.4340	293.4254	170.3145	176.5660	342.7961	504.6781	532.0972	528.4571 (95)	
Heat loss rate W	5.1000	5.0000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)	
Month fracti	956.9409	933.5016	835.2850	686.3010	489.6013	293.7239	170.3273	176.5892	345.4609	572.4305	782.3968	950.2918 (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	298.1384	215.1979	132.3532	37.9540	5.3324	0.0000	0.0000	0.0000	0.0000	50.4078	180.2157	313.8450 (98)	
Space heating per m2												1233.4446 (98)	
										(98) / (4) =		18.8600 (99)	

8c. Space cooling requirement



FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 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)
Fraction of main heating from main system 2													0.0000	(203)
Fraction of total heating from main system 1													1.0000	(204)
Fraction of total heating from main system 2													0.0000	(205)
Efficiency of main space heating system 1 (in %)													100.0000	(206)
Efficiency of main space heating system 2 (in %)													0.0000	(207)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													1233.4446	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	298.1384	215.1979	132.3532	37.9540	5.3324	0.0000	0.0000	0.0000	0.0000	50.4078	180.2157	313.8450	(98)	
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)	
Space heating fuel (main heating system)	298.1384	215.1979	132.3532	37.9540	5.3324	0.0000	0.0000	0.0000	0.0000	50.4078	180.2157	313.8450	(211)	
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)	
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)	
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)	
Space heating fuel used, main system 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)	
Water heating requirement	165.2431	145.2940	151.7618	134.8947	131.3598	116.1785	110.4391	122.7547	123.0295	139.9344	149.4118	160.8795	(64)	
Efficiency of water heater (217)m	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	(216)	
Fuel for water heating, kWh/month	47.2920	41.5827	43.4337	38.6064	37.5947	33.2499	31.6073	35.1320	35.2106	40.0488	42.7612	46.0432	(219)	
Water heating fuel used												472.5626	(219)	
Annual totals kWh/year														
Space heating fuel - main system												1233.4446	(211)	
Space heating fuel - secondary												0.0000	(215)	
Electricity for pumps and fans:														
Total electricity for the above, kWh/year												0.0000	(231)	
Electricity for lighting (calculated in Appendix L)												295.4685	(232)	
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.00 * 1.00 * 1140 * 1.00) =												-912.0798	(233)	
Total delivered energy for all uses												1089.3958	(238)	

10a. Fuel costs - using BEDF prices (554)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1233.4446	25.0500	308.9779 (240)
Space heating - main system 2	0.0000	25.0500	0.0000 (241)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	472.5626	25.0500	118.3769 (247)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Energy for lighting	295.4685	25.0500	74.0149 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit	-912.0798	25.0500	-228.4760 (252)
Total energy cost			272.8937 (255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1233.4446	0.5190	640.1577 (261)
Space heating - main system 2	0.0000	0.5190	0.0000 (262)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	472.5626	0.5190	245.2600 (264)
Space and water heating			885.4177 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	295.4685	0.5190	153.3481 (268)
Energy saving/generation technologies			
PV Unit	-912.0798	0.5190	-473.3694 (269)
Total kg/year			565.3964 (272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1233.4446	3.0700	3786.6749 (261)
Space heating - main system 2	0.0000	3.0700	0.0000 (262)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	472.5626	3.0700	1450.7671 (264)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

Space and water heating			5237.4420 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	295.4685	3.0700	907.0883 (268)
Energy saving/generation technologies			
PV Unit	-912.0798	3.0700	-2800.0850 (269)
Primary energy kWh/year			3344.4452 (272)
Primary energy kWh/m2/year			51.1383 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 90
Current environmental impact rating: B 91

(For testing purposes):

A	Not considered
B	Not considered
C	Not considered
D	Not considered
E Low energy lighting	Already installed
F	Not considered
G	Not considered
H	Not considered
I	Not considered
J	Not considered
K	Not considered
M	Not considered
N Solar water heating	Not applicable
O	Not considered
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U Solar photovoltaic panels	Not applicable
A2	Not considered
A3	Not considered
T2	Not considered
W	Not considered
X	Not considered
Y	Not considered
J2	Not considered
Q2	Not considered
Z1	Not considered
Z2	Not considered
Z3	Not considered
Z4	Not considered
Z5	Not considered
V2 Wind turbine	Not applicable
L2	Not considered
Q3	Not considered
O3	Not considered

Recommended measures: SAP change Cost change CO2 change
(none)

Recommended measures (none)	Typical annual savings	Energy efficiency	Environmental impact
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 90
Potential environmental impact rating: B 91

Fuel prices for cost data on this page from database revision number 554 TEST (31 Oct 2024)
Recommendation texts revision number 4.9c (22 Feb 2014)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current £501	Potential £501	Saving £0
Electricity			
Space heating	£309	£309	£0
Water heating	£118	£118	£0
Lighting	£74	£74	£0
Generated (PV)	-£228	-£228	£0
Total cost of fuels	£273	£273	£0
Total cost of uses	£273	£273	£0
Delivered energy	17 kWh/m²	17 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.6 tonnes	0.6 tonnes	0.0 tonnes
CO2 emissions per m²	9 kg/m²	9 kg/m²	0 kg/m²
Primary energy	51 kWh/m²	51 kWh/m²	0 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

No improvements selected / applicable

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