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SUSTAINABILITY & ENERGY STATEMENT

KIRK HOUSE

97-109 HIGH STREET

WEST DRAYTON

UB7 7QR

DOCUMENT CONTROL

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1. EXECUTIVE SUMMARY

SHA Environmental has been commissioned to prepare an energy and sustainability statement for a full planning application proposal under the jurisdiction of the London Borough of Hillingdon. The site is located at KIRK HOUSE, 97-109 HIGH STREET, WEST DRAYTON, UB7 7QR. The site currently contains a block of residential units with the proposal to create an additional 4 units through a conversion of the roof space to the second floor. The development will create 8 new two bedroom flats.

This Sustainability and Energy Statement demonstrates that the development will incorporate sustainable design and construction measures throughout all stages of the development. It sets out how the development will comply with relevant National, Regional and Local Policies. This Energy Statement provides an assessment of the energy demand and Carbon Dioxide (CO₂) emissions for the proposed residential development.

The proposed residential development will be compared with the notional dwelling set under the Building Regulations Approved Document Part L1B 2013. The predicted energy consumption has been based upon preliminary proposed drawings received from Quad Architects.

The energy strategy seeks to address the following main objectives for the proposed building:

1. Comply with 2013 Building Regulations, Approved Document Part L1B (ADL1B)
2. To achieve a reduction in CO₂ emissions in accordance with the London Plan 2021, this development is a minor development and therefore not under the requirements of the London Plan
3. Compare the proposed dwelling to a Building Regulations Approved Document Part L1B (ADL1B) conversion

Energy Efficiency Measures

The following energy efficiency measures are proposed:

- Low u-values and air permeability rates for the building fabric
- Time and zone heating controls
- Electric heating and hot water systems in accordance with the UK Governments decarbonisation strategy
- Window size, orientation, opening and solar shading - windows on the south-facing elevation have been designed to benefit from passive solar gain. This will reduce space heating demand. Glazing with an optimal 'g' value has been specified to maximise solar gains benefits whilst not causing an overheating risk, in conjunction with the use of openable windows

- 100% Low energy lighting
- Use low water use fittings- This reduces the amount of hot water consumed and hence the energy used to produce hot water, 105litres/person/day using the Code for Sustainable Homes WAT 01 calculation procedure, this equates to 110litres/person/day using the Building Regulations Approved Document Part G calculation procedure and is the enhanced standard target.

Low and Zero Carbon & Renewable Technology

The site is not suitable for an on-site Combined Heat and Power (CHP) system due to the size of the development.

A 1.2kWp solar system has been specified for each unit to reduce the CO₂ emissions further. Therefore there is a total of 4.8kWp of solar energy supplied to the proposed development. A total of 14 solar panels have been included in the energy calculations which require a total area of 21m².

CO₂ Savings

- It is highlighted that this energy strategy has been developed at a very early stage in the design process and much of the information that has been used as the basis for the thermal modelling is at a preliminary stage and hence subject to change. Actual energy demands for the proposed design may, therefore, vary from the consumption figures used for modelling purposes at this stage and hence the results of this energy strategy must be considered as indicative only. The stated energy reduction targets will be adhered to as part of the developed design process.
- The referenced measures result in a reduction of **6.43 tonnes of CO₂ per annum** for the proposed development, which is a **59.76%** improvement over a baseline Part L1B 2013 compliant conversion.
- The CO₂ reduction figures and assessment methodology used are based on SAP 2012 carbon factors in accordance with Government Guidance on energy models.
- **As a result of the proposed concept design strategy, the site's total regulated CO₂ emissions will be - 4.33 tonnes of CO₂ per annum.**

The following tables present the improvements to the development's CO₂ emissions based on the sequential approach of the energy strategy.

Table 1: Carbon Dioxide Emissions after each Stage of the Energy Hierarchy

SAP 2012 CO2 PERFORMANCE	Carbon Dioxide Emissions for Domestic Buildings (Tonnes CO2 per annum)		
	Regulated	Unregulated	Total
Baseline: Part L 2013 of the Building Regulations Complaint Development (A)	10.77	4.87	15.63
Proposed Scenario (B)	4.33	4.87	9.20

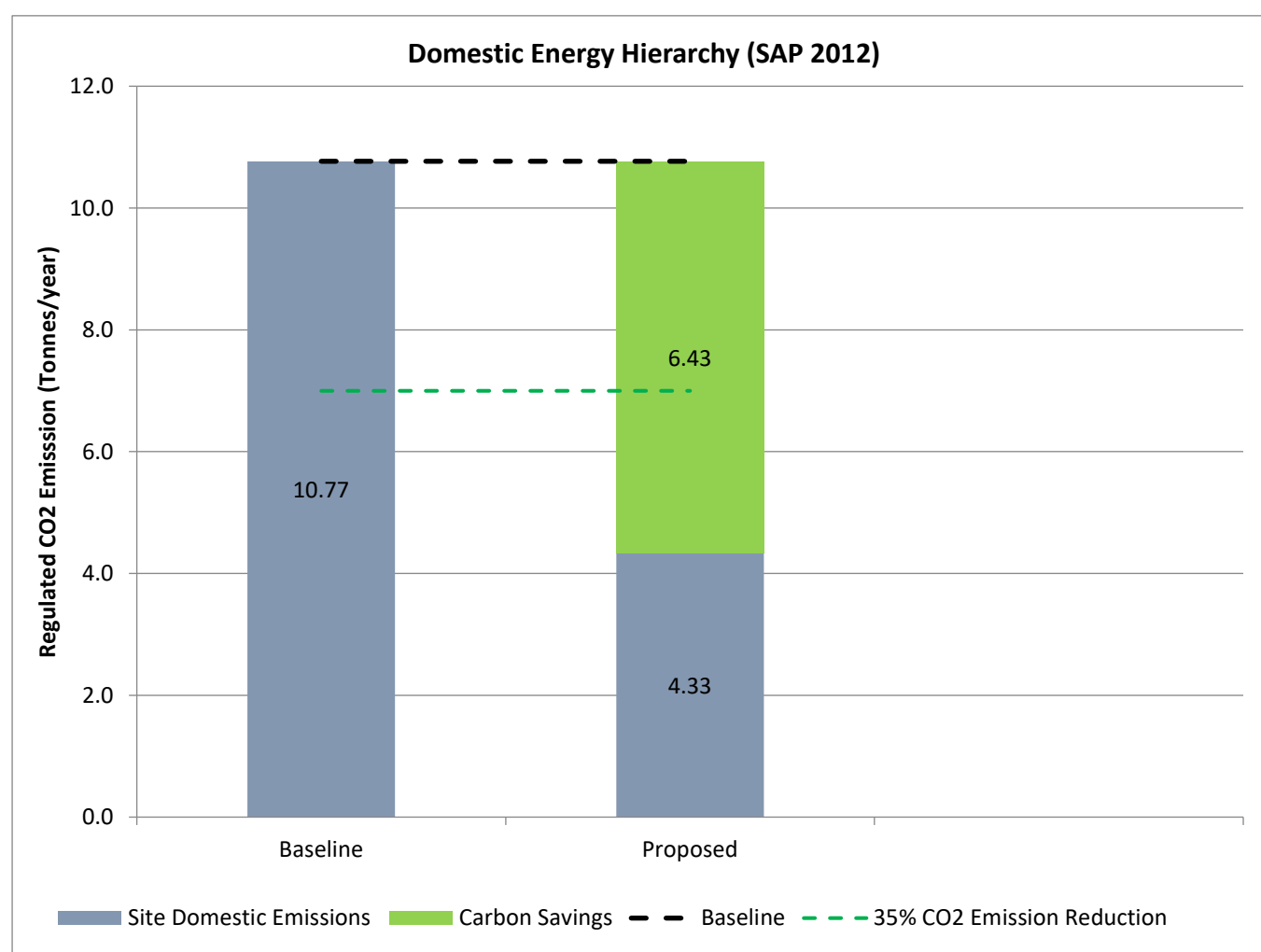


Figure 1: New Build Development CO₂ Emissions as per the Energy Hierarchy

Table 2: Regulated Carbon Dioxide Savings from each Stage of the Energy Hierarchy for the Site

SAP 2012 CO2 PERFORMANCE	Regulated domestic carbon dioxide savings		
		Tonnes CO2 per annum	%
Savings from proposed scenario	A-B	6.43	59.76%
Cumulative on site savings		6.43	59.76%
Carbon Shortfall		4.33	-
	(Tonnes CO2)		
Cumulative Savings for offset Payment (G)		-	
Cash-in-Lieu Contribution (£)		-	

SAP 2012 CO2 PERFORMANCE	DER	%
	kgCO2/m2/year	
Baseline: Part L 2013 of the Building Regulations Complaint Development (A)	41.58	59.76%
Proposed Scenario (B)	16.73	

2. INTRODUCTION

SHA Environmental has been commissioned to prepare an energy and sustainability statement for a full planning application proposal under the jurisdiction of the London Borough of Hillingdon. The site is located at KIRK HOUSE, 97-109 HIGH STREET, WEST DRAYTON, UB7 7QR. The site currently contains a block of residential units with the proposal to create an additional 8 units through a conversion of the roof space to the second floor. The development will create 4 new two bedroom flats.

The purpose of this document is to highlight the sustainable and energy efficiency features of the proposed new construction. It also addresses the current planning framework identifying the design measures that meet these policies.

This report details the energy strategy that has been completed for the development site. As part of this, detailed SAP calculations have been undertaken along with thermal bridge detailing to ensure that even at this early stage, potential energy wastage as part of the operation of the development has been designed out.

2.1 SITE CONTEXT

The site is located at KIRK HOUSE, 97-109 HIGH STREET, WEST DRAYTON, UB7 7QR. The site is located on the high street of West Drayton which is a busy high street containing a mix of uses. Additional residential makes the most use of the constrained land in the area to create additional residential uses.

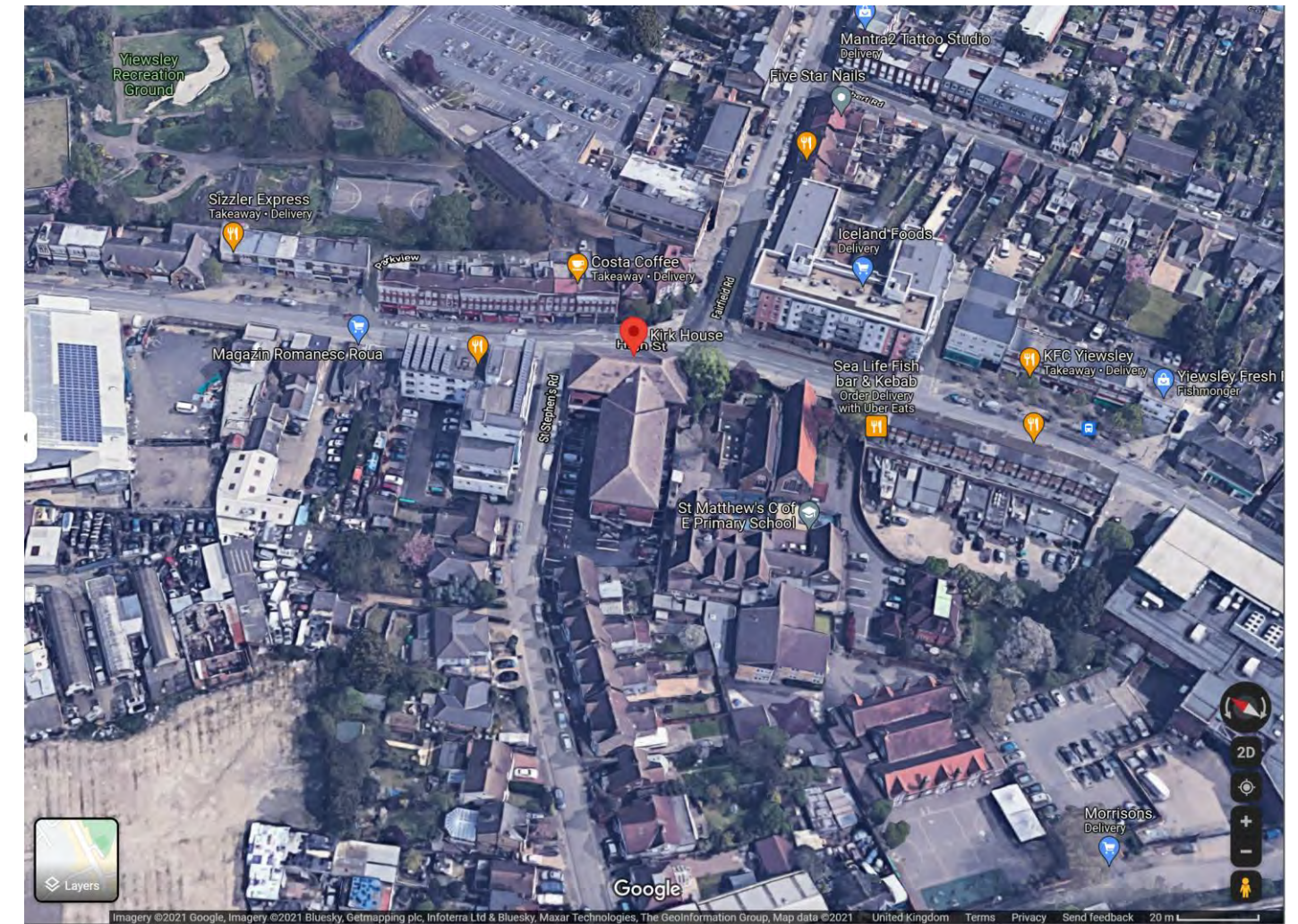
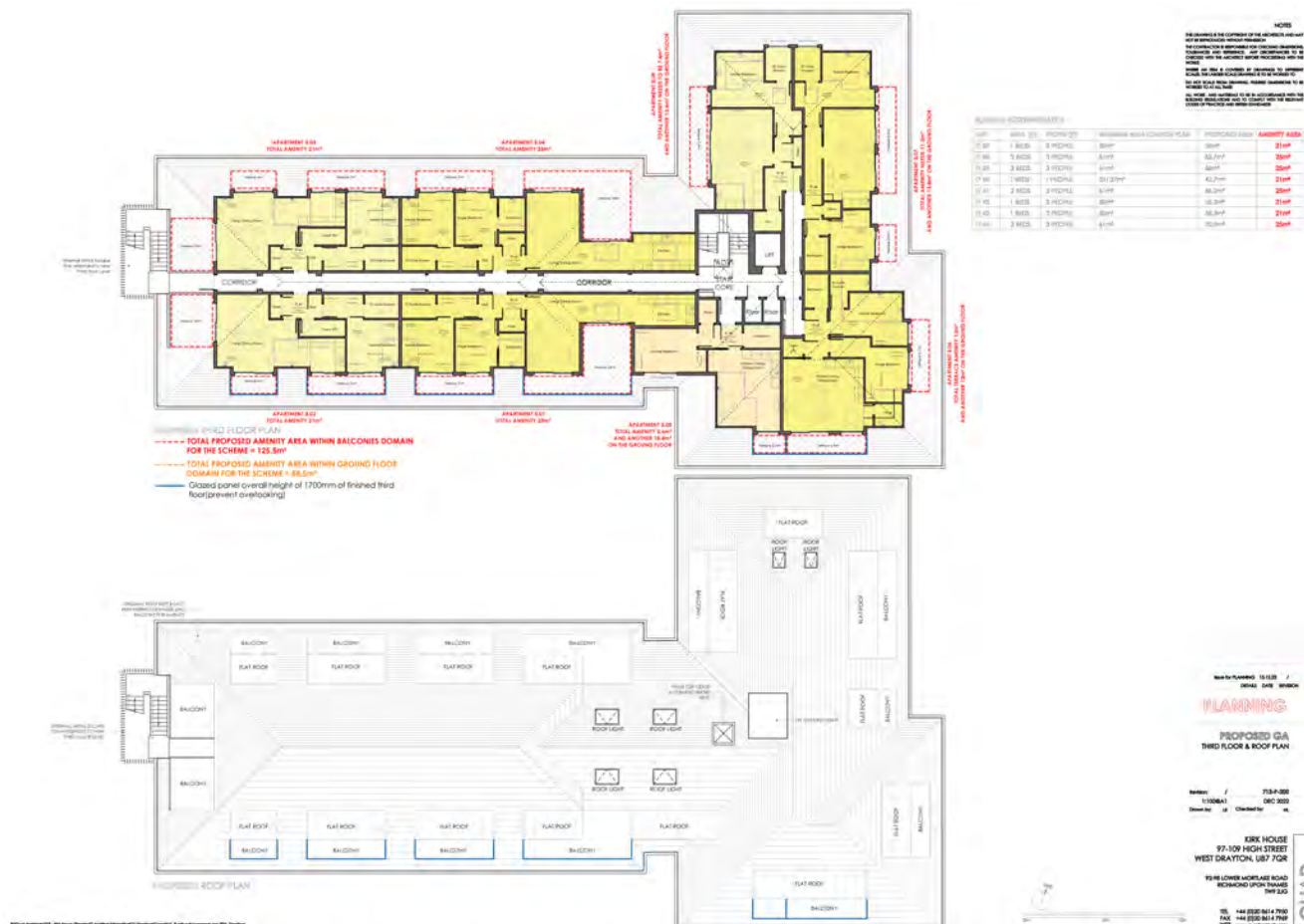


Figure 3: Satellite View of the Existing Site



3. ROAD TO SUSTAINABILITY

Developing sustainable projects is part of today's business reality. Costs for sustainable initiatives and strategies are reducing through improvements in technology, supply, design techniques and construction methods. Utility prices are rising and continue to do so. Individuals and organisations are starting to value the more intangible benefits associated with sustainability. Tenants, the Government and the general public are becoming increasingly more educated about the need for sustainable environments and are starting to demand these are provided where they live, work and play.

Organisations that embrace sustainability as an integral part of business planning seek to retain or grow the value of their assets over the medium to long term.

Adaptation

Even if we were to immediately curb our impact on the environment, the time lag in realising the benefits of these changes would be measured in decades. For a long time, the main focus of climate change has been on mitigation – making sure we minimise our impact on the environment. Adaptation strategies are those that take into account climate change and ensure that the building is capable of dealing with a future change in the climate. Given the time lag associated with climate change, even if we change the way we live, there is likely to be a noticeable change in the climate during the life of the building.

To ensure that buildings maintain their relevance, adaptation strategies must be addressed during the design phase. Adoption of these strategies will mean that, even as we undergo climate change, the buildings can still function as required.

Sustainability in the Design Process

Sustainable development is a core principle throughout this project. It is important to understand the issues and drivers related to the site and the local area. Starting with a review of national, regional and local planning policies, key policies and regulations have been highlighted and used to guide the direction of the design.

A series of design team meetings commenced in 2021 and were used to discuss sustainability options and initiatives for the development. The aim was of these meetings was to maximise the contribution of the scheme to sustainable development within the site and local area constraints.

3.1 NATIONAL LEVEL PLANNING POLICY

The Government has developed the National Planning Policy Framework (NPPF) (Department for Communities and Local Government, 2021) which plays a key role in delivering the Government's objectives on sustainable development. The framework encourages ownership at the local level and guides to promote effective environmental protection, economic growth and ensuring a better quality of life for all, both now and in future generations.



Some of the main objectives of the Governments planning framework concerning sustainability are:

- Build prosperous communities with opportunities for employment and economic growth across all areas of society;
- Reduce the need for car dependency and provide easy access to public transport;
- Maintain, and enhance or restore biodiversity and geological interests;
- Help reduce carbon emissions through the adoption of passive design, and low and zero-carbon renewable technologies (LZCs);
- Protect the condition of the land, its use, and its development from potential hazards;
- Ensure that all new developments contribute to the Governments targets of carbon emission reductions.
- Supporting the building of zero-carbon homes and business premises that are low energy and produce lower carbon emissions
- Supporting integrated development

3.2 LOCAL PLANNING POLICY_WALTHAM FOREST EMERGING LOCAL PLAN

The adopted local plan rdoesnt specifically set CO2 reduction targets for minor developments or conversion schemes and therefore for the purpose of this report a target of 35% reduction in CO2 emissions has been set as the target for CO2 emissions reduction in accordance with the London Plan.

Policy EM1: Climate Change Adaptation and Mitigation

The Council will ensure that climate change mitigation is addressed at every stage of the development process by:

1. Prioritising higher density development in urban and town centres that are well served by sustainable forms of transport.
2. Promoting a modal shift away from private car use and requiring new development to include innovative initiatives to reduce car dependency.
3. Ensuring development meets the highest possible design standards whilst still retaining competitiveness within the market.
4. Working with developers of major schemes to identify the opportunities to help provide efficiency initiatives that can benefit the existing building stock.
5. Promoting the use of decentralised energy within large scale development whilst improving local air quality levels.
6. Targeting areas with high carbon emissions for additional reductions through low carbon strategies. These strategies will also have an objective to minimise other pollutants that impact on local air quality. Targeting areas of poor air quality for additional emissions reductions.
7. Encouraging sustainable techniques to land remediation to reduce the need to transport waste to landfill. In particular developers should consider bioremediation⁽³⁹⁾ as part of their proposals.
8. Encouraging the installation of renewable energy for all new development in meeting the carbon reduction targets savings set out in the London Plan. Identify opportunities for new sources of electricity generation including anaerobic digestion, hydroelectricity and a greater use of waste as a resource.
9. Promoting new development to contribute to the upgrading of existing housing stock where appropriate.

The Borough will ensure that climate change adaptation is addressed at every stage of the development process by:

10. Locating and designing development to minimise the probability and impacts of flooding.
11. Requiring major development proposals to consider the whole water cycle impact which includes flood risk management, foul and surface water drainage and water consumption.
12. Giving preference to development of previously developed land to avoid the loss of further green areas.

13. Promoting the use of living walls and roofs, alongside sustainable forms of drainage to manage surface water run-off and increase the amount of carbon sinks⁽⁴⁰⁾.
14. Promoting the inclusion of passive design⁽⁴¹⁾ measures to reduce the impacts of urban heat effects.

Policy EM8: Land, Water, Air and Noise

Water Quality

The Council will seek to safeguard and improve all water quality, both ground and surface. Principal Aquifers, and Source Protection Zones will be given priority along with the:

- River Colne
- Grand Union Canal
- River Pinn
- Yeading Brook
- Porter Land Brook
- River Crane
- Ruislip Lido

Air Quality

All development should not cause deterioration in the local air quality levels and should ensure the protection of both existing and new sensitive receptors.

All major development within the Air Quality Management Area (AQMA) should demonstrate air quality neutrality (no worsening of impacts) where appropriate; actively contribute to the promotion of sustainable transport measures such as vehicle charging points and the increased provision for vehicles with cleaner transport fuels; deliver increased planting through soft landscaping and living walls and roofs; and provide a management plan for ensuring air quality impacts can be kept to a minimum.

The Council seeks to reduce the levels of pollutants referred to in the Government's National Air Quality Strategy and will have regard to the Mayor's Air Quality Strategy. London Boroughs should also take account of the findings of the Air Quality Review and Assessments and Actions plans, in particular where Air Quality Management Areas have been designated.

The Council has a network of Air Quality Monitoring stations but recognises that this can be widened to improve understanding of air quality impacts. The Council may therefore require new major development in an AQMA to fund additional air quality monitoring stations to assist in managing air quality improvements.

Noise

The Council will investigate Hillingdon's target areas identified in the Defra Noise Action Plans, promote the maximum possible reduction in noise levels and will minimise the number of people potentially affected.

The Council will seek to identify and protect Quiet Areas in accordance with Government Policy on sustainable development and other Local Plan policies.

The Council will seek to ensure that noise sensitive development and noise generating development are only permitted if noise impacts can be adequately controlled and mitigated.

Land Contamination

The Council will expect proposals for development on contaminated land to provide mitigation strategies that reduce the impacts on surrounding land uses. Major development proposals will be expected to demonstrate a sustainable approach to remediation that includes techniques to reduce the need to landfill.

Water Resources

The Council will require that all new development demonstrates the incorporation of water efficiency measures within new development to reduce the rising demand on potable water. All new development must incorporate water recycling and collection facilities unless it can be demonstrated it is not appropriate. For residential developments, the Council will require applicants to demonstrate that water consumption will not surpass 105 litres per person per day.

4. CONCLUSION FROM SUSTAINABILITY APPRAISAL

The following sections each describe the context of sustainability and then outline the main sustainability features for the proposed development, which will be included where practical.

4.1 RE-USE OF LAND AND BUILDINGS

The re-use of land and buildings are key issues within the Government's policies addressing sustainability. The national policies identify land as a scarce resource and as such, developments should seek to reuse land and empty property wherever possible, and use new land outside of the urban environment as a final option.

The footprint of the proposed development falls within the previously developed land. The proposed development is being developed on top of an existing building to increase the urban density in the area, to make full use of the limited land space available.

4.2 CONSERVE ENERGY, WATER AND OTHER RESOURCES

The impact that the built environment has on climate change and the associated feedback loop of climate change on the built environment is well documented. The development has an opportunity to demonstrate a best practice approach to addressing these issues. The most significant source of emissions is associated with the ongoing operation of the building. A hierarchy for reducing these emissions are integral to the design process of the buildings.

Measures to be considered for the proposed development:

- **Passive design measures have been selected to provide adequate ventilation and natural cooling.**
- **The development will minimise carbon dioxide emissions across the site by following Energy Hierarchy: 'Be Lean', 'Be Clean', 'Be Green', leading to the achievement of a 59.76% improvement over Building Regulations. The proposed CO2 emission reduction over the baseline emission which represents a significant improvement.**
- **The feasibility to connect to existing and potential district heating networks has not been considered due to the scale of the Development.**
- **Lighting will be 100% low energy, appropriately zoned and occupant controllable**
- **There will be energy efficient external lighting specified and all light fittings will be controlled for the presence of daylight.**
- **Low water use fittings will be specified in all residential units to reduce water consumption (Relates to CSH Level 4/Building Regulations Part G enhanced water consumption standards).**

4.3 CONSERVE & ENHANCE THE NATURAL ENVIRONMENT & BIODIVERSITY

It is important to recognise the benefits of wildlife to people and help to identify ways to better promote, and engage people in, biodiversity conservation in the area.

The proposals do not include any biodiversity or ecological improvements to the site.

4.4 CLIMATE CHANGE ADAPTATION AND RESILIENCE

Climate change is the rise in average global temperature due to increasing levels of greenhouse gases in the earth's atmosphere (primarily CO₂) that prevent the radiation of heat into space. The climate change projections for London are

- Hotter summers
- Milder winters
- Increased periods without rain
- Increased intensity in rainfall
- More extreme weather events

Buildings and spaces built today should respond to climate change issues and adapt to mitigation and adaptation measures. The London Borough of Waltham Forest through its policies addresses these issues and will require consider how their developments will function in the future in the context of changing climate.

4.5 CLIMATE CHANGE MITIGATION & ADAPTATION MEASURES

Even if we were to immediately curb our impact on the environment, the time lag in realising the benefits of these changes would be measured in decades. For a long time, the main focus of climate change has been on mitigation – making sure we minimise our impact on the environment. Adaptation strategies are those that take into account climate change and ensure that the building is capable of dealing with present and future change in the climate. Given the time lag associated with climate change, even if we change the way we live, there is likely to be a noticeable change in the climate during the life of the building.

To ensure that buildings maintain their relevance, adaptation strategies must be addressed during the design phase. Adoption of these strategies will mean that, even as we undergo climate change, the buildings can still function as required.

For development proposals, the early design stage is the most cost-effective time to incorporate relevant design and technological measures to adapt to climate change. Responding to climate change must be an integral and essential part of the development process. This will be to ensure that buildings are fit for purpose in the future. Preventative and adaptive measures will generate long-term savings particularly for energy and water use and over time the inclusion of such measures should have positive impacts on the property value as occupiers become more aware of the impacts of climate change on their environment.

Energy-efficient dwellings/buildings will be well insulated, have low air permeability and make use of winter solar gain, however, the effects of these improved standards are increased risk of overheating from solar gains in summer which could result in increased use of energy for cooling.

5. GUIDING PRINCIPLES FOR BUILDING SERVICES SYSTEM SELECTION

5.1 ASSESSMENT AND ANALYSIS

The predicted energy consumption is based on concept design stage information. Actual energy demands for the proposed design may vary from the consumption figures used for modelling purposes at this stage. This is a conversion project of 4 x single storey residential flats created through a vertical extension to the existing development..

The calculation methodology used to predict energy consumption and carbon dioxide emissions are the same as that approved for demonstrating compliance with Part L1B of the Building Regulations

- The Standard Assessment Procedure for the Energy Rating of Dwellings (SAP 2012). Approved Document L1B (AD L1B) has been used. Tables 1-3 have been used to create an L1B compliant conversion unit with the same geometry of that as the proposed units. This is then used as a baseline assessment to allow for the proposed development with the building fabric and services to be improved and compared against the baseline..
- The Building Regulations only control the certain end uses of energy (heating, hot water, cooling, fans, pumps and controls; and lighting). The approved software also calculates the major non-controlled end uses.
- For dwellings, small power and cooking (Section 16 of SAP 2012).

5.2 BASELINE EMISSIONS

This is the building designed to comply with the Notional Dwelling minimum standards of the building regulations using energy-efficient electric heating systems with a preference towards infrared heating as the most efficient direct electric system. The baseline emissions are set from Tables 1 and 2 in the ADL1B which is the same size and shape as the 'actual dwelling'. Undertaking this process sets the baseline emissions of a standard conversion from which the development is compared against.

Table 3: Building Regulations Approved Document L1B Baseline Dwelling Energy Performance Ratings

Element	Value
All Roofs	0.16 W/m ² ·K
Walls	0.28 W/m ² ·K
Floors	0.22 W/m ² ·K
Party Walls	0.00 W/m ² ·K
Windows, Roof Windows, Glazed Roof lights & Glazed Doors	1.60 W/m ² ·K / g-value 0.63
Opaque Doors	1.80 W/m ² ·K
Semi Glazed Doors	1.80 W/m ² ·K
Air-tightness	15.00 m ³ /hr/m ² at 50 Pa
Linear Thermal Transmittance	Standardised ψ -values (see Appendix R of SAP 2012)
Thermal Mass	Medium

5.3 LEAN MEASURES

Improvements to the building fabric and building services, in comparison to the Notional performance criteria used to calculate the TER. The preferred ranges of measures are selected and the carbon dioxide emissions for a design with lean measures are calculated.

At this stage, the performance specification should demonstrate compliance with ADL1B, in respect of:

- Criterion 1 - Achieving the Baseline Emissions
- Criterion 2 - Limitations on design flexibility
- Criterion 3 - Limiting effects of solar heat gains in summer

Due to the limitations of the Standard Assessment Procedure (SAP), some lean measures may be incorporated that have no impact on the reported comparative predicted energy consumption or carbon dioxide emissions, for example, water-efficient showers and taps, and white goods that are 'A' rated for energy efficiency.

The thermal improvements that are considered to the base model to reduce energy demand are as follows:

- Thermal, time and zone controls. These are easily used by the occupants, reduces overheating and stops rooms from being heated when not occupied
- Windows will be sized to suit appropriate daylight levels and to reduce space heating demand. Glazing with low 'g' values will reduce overheating and reduce excessive solar gain.
- Low energy lighting- Reduce energy consumed by lighting.
- Use low water use fittings- This reduces the amount of hot water consumed and hence the energy used to produce hot water.

5.4 CLEAN MEASURES

The technical and economic feasibility of the following heating and cooling systems are then considered sequentially

- Connection to existing CCHP/CHP distribution networks
- Site-wide CCHP/CHP or hydrogen fuel cells
- Communal heating and cooling

The highest-ranking option is selected, where feasible.

Due to the size of the development, the provision of CCHP/ CHP would not be feasible due to the cost of these systems and the running hours of the sites heating demand.

5.5 GREEN MEASURES

This section summarises the renewable energy options reviewed for the scheme. The technologies are assessed using the methodologies outlined in the GLA Toolkit.

A 4.2kWp solar system has been specified for the development which will be split with 1.2kWp supplied to each flat on an individual inverter so the flats benefit from the free generated solar energy.

6. SAP MODEL INPUT PARAMETERS

The following Table 4 and Table 5 shows the comparison of modelling input parameters. The notional dwelling performance is compared with actual design dwelling performance. Designed dwelling performance is iterated with three cases i.e. Be Lean case, Be Clean Case and Be Green Case. The difference of input parameters in these three cases has been mentioned in below Table 4 and Table 5. For this energy statement all measures have been included within the proposed development case.

Table 4: Comparison of SAP Model Input Parameters

Elements	Notional Dwelling Performance	Dwellings Designed Performance		
		Be Lean Case	Be Clean Case	Be Green Case
External Wall (W/m ² .K)	0.28	0.18	0.18	0.18
Roof (W/m ² .K)	0.16	0.12	0.12	0.12
Floor (W/m ² .K)	0.22	N/A	N/A	N/A
Windows (W/m ² .K)	1.60	1.20	1.20	1.20
Roof light (W/m ² .K)	1.60	N/A	N/A	N/A
Solid Doors (W/m ² .K)	1.80	1.20	1.20	1.20
Thermal Bridging, Y value	Default ψ -values	Default ψ -values	Default ψ -values	Default ψ -values
Thermal Mass	Medium	Calculated	Calculated	Calculated
Air Permeability, m ³ .hr/m ²	15.00 at 50 Pa	15.00 at 50 Pa	15.00 at 50 Pa	15.00 at 50 Pa
Ventilation	Natural	Natural	Natural	Natural
Low Energy Lighting %	75%	100	100	100
Space Heating	SEDBUK 2009 Boiler	Direct Electric Heating	Direct Electric Heating	Direct Electric Heating

Table 5: Comparison of SAP Model Input Parameters

Elements	Notional Dwelling Performance	Dwellings Designed Performance		
		Be Lean Case	Be Clean Case	Be Green Case
Heating Controls	Programmer, room thermostat and TRVs	Programmer, room thermostat and TRVs	Time and Temperature Zone Control	Time and Temperature Zone Control
Hot Water Heating	From Main Gas Boiler	From PCM heat battery or equivalent modern HWC	From PCM heat battery or equivalent modern HWC	From PCM heat battery or equivalent modern HWC
Photovoltaic System Units (kWh/year)	NA	NA	NA	1.2kWp/unit

After completing all input parameters, the software provides results in terms of carbon dioxide emissions and fabric energy efficiency. The next chapter discusses the summary of SAP modelling results with various design options and their comparisons.

7. SUMMARY OF MODELLING RESULTS

7.1 BUILDING REGULATIONS 2013 AD L1B-TOTAL SITE DOMESTIC AREAS

■ Criterion 1: Achieving the TER and TFEE rate

Table 6: DER and TER Results of Total Site

SAP 2012 CO2 PERFORMANCE	Carbon Dioxide Emissions for Domestic Buildings (Tonnes CO2 per annum)		
	Regulated	Unregulated	Total
Baseline: Part L 2013 of the Building Regulations Complaint Development (A)	10.77	4.87	15.63
Proposed Scenario (B)	4.33	4.87	9.20
SAP 2012 CO2 PERFORMANCE	Regulated domestic carbon dioxide savings		
		Tonnes CO2 per annum	%
Savings from proposed scenario	A-B	6.43	59.76%
Cumulative on site savings		6.43	59.76%
Carbon Shortfall		4.33	-
(Tonnes CO2)			
Cumulative Savings for offset Payment (G)		-	
Cash-in-Lieu Contribution (£)		-	
SAP 2012 CO2 PERFORMANCE	DER	%">	
	kgCO2/m2/year		
Baseline: Part L 2013 of the Building Regulations Complaint Development (A)	41.58	59.76%	
Proposed Scenario (B)	16.73		

- o In the 'Proposed' case, the DER is **16.73 kg of CO₂/ m²/year** and the baseline dwellings emissions are **41.58 kg of CO₂/ m²/year** with a difference of **-59.76%**. As DER is lower than the BER, the site passess criterion 1 of building regulations 2013 ADL1B

■ Criterion 2: Limits on Design Flexibility

- o The thermal properties of the building fabric and the efficiencies of the building services with an effective control system that have been specified **comply with the minimum energy efficiency standards**.
- o All the U values in the proposed design are less than that of 'Limiting Fabric U values' provided in building regulations 2013 ADL1B.

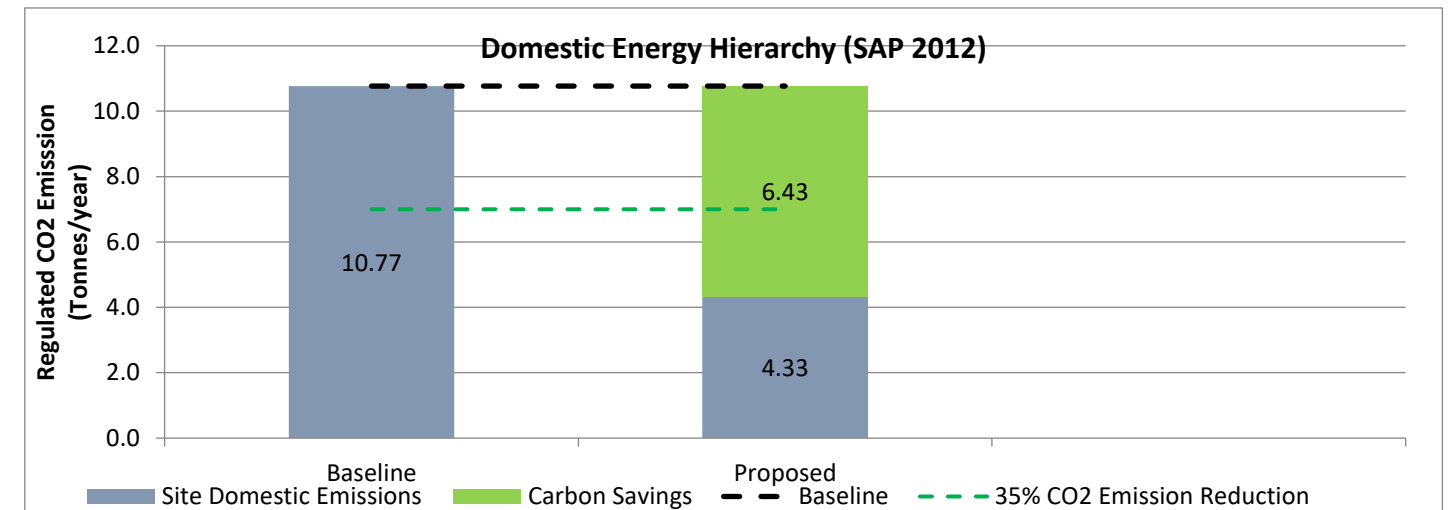
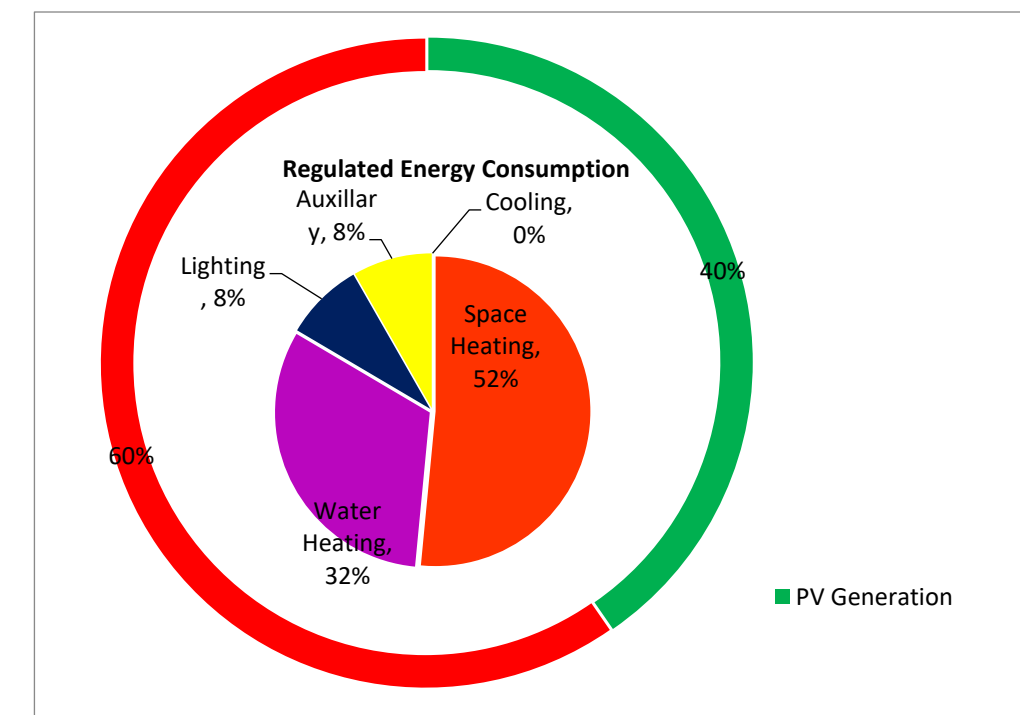


Figure 4: Bar Chart Comparison Showing CO₂ Emissions of Total Site



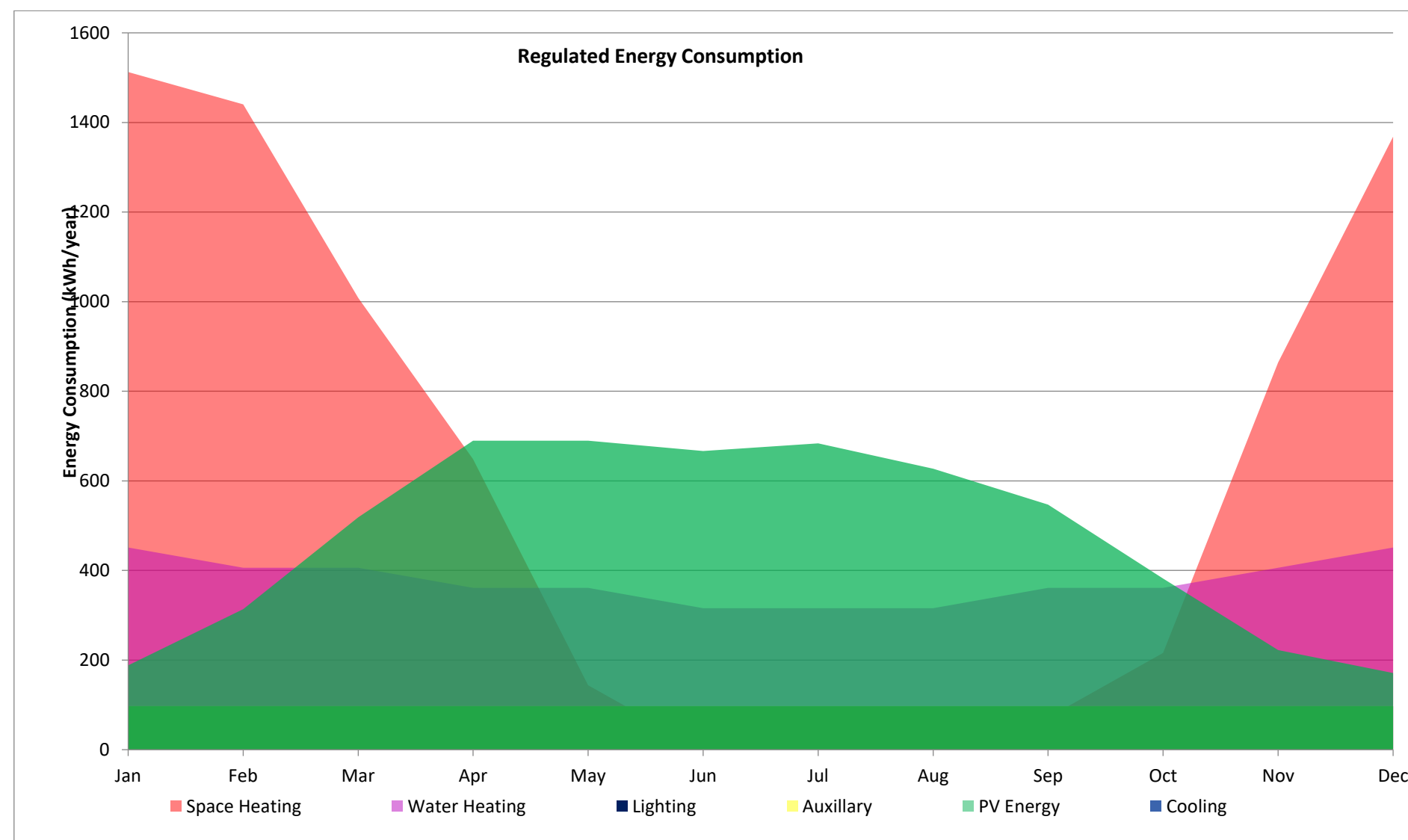


Figure 5: Average Energy Demand and Solar PV Profile for Single Dwelling

8. CONCLUSION

This report represents the energy and sustainability statement for a full planning application proposal in the jurisdiction of the London Borough of Hillingdon. The site is located at KIRK HOUSE, 97-109 HIGH STREET, WEST DRAYTON, UB7 7QR. The development consists of 4 new residential units created through an extension to the existing building and have therefore been assessed under Part L1B of the Approved Building Regulations 2013 (and subsequent amendments). The baseline dwellings have been assessed using information in Tables 1 and 2 of ADL1B.

The development achieves a reduction in CO2 emissions of 59.76%.

It is highlighted that this energy strategy has been developed at a very early stage in the design process and much of the information that has been used as the basis for the thermal modelling is at a preliminary stage and hence subject to change.

9. APPENDIX B SAP OUTPUT SHEET (PROPOSED)

The attached SAP sheets shows that the development has been assessed as a new build dwelling however this is only to be able to extract the relevant information for the energy analysis. This is a conversion scheme assessed under ADL1B and the scheme complies with the advice and guidance of assessing this type of development under the London Plan.



SAP Report Submission for Building Regulations Compliance

Client:

Project:

UB7 7QR

Contact: Dion Mellows
SHA Environmental Limited
info@shaenvironmental.co.uk

Report Issue Date: 20/10/2021

EXCELLENCE
IN ENERGY
ASSESSMENT

PREDICTED ENERGY ASSESSMENT



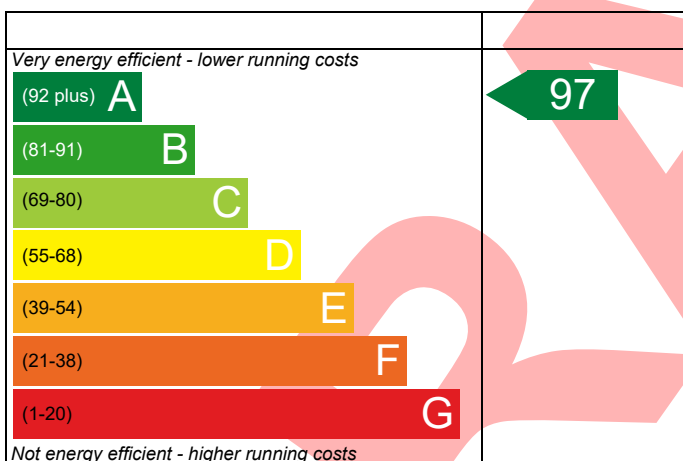
UB7 7QR

Dwelling type: House, Semi-Detached
 Date of assessment: 20/10/2021
 Produced by: SHA Environmental Limited
 Total floor area: 64.74 m²

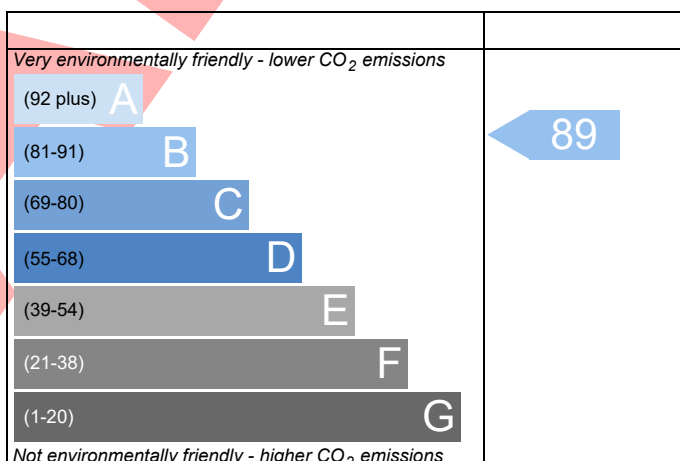
This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP2012 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.

Energy Efficiency Rating



Environmental Impact (CO₂) Rating



England

EU Directive
2002/91/EC

The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

England

EU Directive
2002/91/EC

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO₂) emissions. The higher the rating the less impact it has on the environment.

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Designed)



Property Reference	210928			Issued on Date	20/10/2021
Assessment Reference	APARTMENT 3.04		Prop Type Ref	APARTMENT 3.04	
Property	UB7 7QR				
SAP Rating	97 A	DER	17.43	TER	28.29
Environmental	89 B	% DER<TER	38.40		
CO ₂ Emissions (t/year)	0.62	DFEE	51.63	TFEE	54.21
General Requirements Compliance	Fail	% DFEE<TFEE	4.76		
Assessor Details	Mr. Dion Mellows, SHA Environmental Limited, Tel: 02036370427, info@shaenvironmental.co.uk			Assessor ID	G297-0001
Client					

SUMMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Electricity		
Fuel factor	1.55 (electricity)		
Target Carbon Dioxide Emission Rate (TER)	28.29	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	17.43	kgCO ₂ /m ²	Pass
	-10.86 (-38.4%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	54.21	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	51.63	kWh/m ² /yr	
	-2.6 (-4.8%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Roof	0.12 (max. 0.20)	0.12 (max. 0.35)	Pass
Openings	1.20 (max. 2.00)	1.20 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated using default γ -value of 0.15

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)	m ³ /(h.m ²) @ 50 Pa	
Maximum	10.0	m ³ /(h.m ²) @ 50 Pa	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system	Electric underfloor heating - Electric Underfloor heating in thin screed (standard tariff)	
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This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Designed)



Secondary heating system

None

5 Cylinder insulation

Hot water storage

No cylinder

6 Controls

Space heating controls

Time and temperature zone control

Pass

Hot water controls

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100

%

Minimum

75

%

Pass

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power

1.13

Maximum

1.5

Pass

MVHR efficiency

89

%

Minimum

70

%

Pass

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)

High

Fail

Based on:

Overshading

Average

Windows facing North West

19.63 m², No overhang

Air change rate

4.00 ach

Blinds/curtains

Dark-coloured curtain or roller blind, closed 50% of daylight hours

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

5.00 (design value)

m³/(h.m²) @ 50 Pa

Maximum

10.0

m³/(h.m²) @ 50 Pa

Pass

10 Key features

Party wall U-value

0.00

W/m²K

Roof U-value

0.12

W/m²K

Roof U-value

0.12

W/m²K

Photovoltaic array

2.10

kW

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

RECOMMENDATIONS

	Typical cost	Typical savings per year	Energy efficiency	Environmental impact	Result
Low energy lights			0	0	Already installed
Solar water heating	£4,000 - £6,000	£78	A 99	A 93	Recommended
Photovoltaic			0	0	Already installed
Wind turbine			0	0	Not applicable
Totals	£4,000 - £6,000	£78	A 99	A 93	

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	210928	Issued on Date	20/10/2021
Assessment Reference	APARTMENT 3.04	Prop Type Ref	APARTMENT 3.04
Property	UB7 7QR		

SAP Rating	97 A	DER	17.43	TER	28.29
Environmental	89 B	% DER<TER	38.40		
CO ₂ Emissions (t/year)	0.62	DFEE	51.63	TTEE	54.21
General Requirements Compliance	Fail	% DFEE<TFEE	4.76		

Assessor Details	Mr. Dion Mellows, SHA Environmental Limited, Tel: 02036370427, info@shaenvironmental.co.uk	Assessor ID	G297-0001
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Client	
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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	64.7400 (1b)	x 2.6200 (2b)	= 169.6188 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 169.6188 (5)

2. Ventilation rate

												main	secondary	other		total	m3 per hour						
												heating	heating										
Number of chimneys												0	+	0	+	0	=	0 * 40 =	0.0000 (6a)				
Number of open flues												0	+	0	+	0	=	0 * 20 =	0.0000 (6b)				
Number of intermittent fans																		0 * 10 =	0.0000 (7a)				
Number of passive vents																		0 * 10 =	0.0000 (7b)				
Number of flueless gas fires																		0 * 40 =	0.0000 (7c)				
																		Air changes per hour					
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =																		0.0000 / (5) =	0.0000 (8)				
Pressure test																		Yes					
Measured/design AP50																		5.0000					
Infiltration rate																		0.2500 (18)					
Number of sides sheltered																		3 (19)					
Shelter factor												(20) = 1 - [0.075 x (19)] =						0.7750 (20)					
Infiltration rate adjusted to include shelter factor												(21) = (18) x (20) =						0.1938 (21)					
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec											
Wind speed	4.2000	4.0000	4.0000	3.7000	3.8000	3.5000	3.6000	3.4000	3.4000	3.7000	3.5000	4.0000 (22)											
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9500	0.8750	0.9000	0.8500	0.8500	0.9250	0.8750	1.0000 (22a)											
Adj infilt rate	0.2034	0.1938	0.1938	0.1792	0.1841	0.1695	0.1744	0.1647	0.1647	0.1792	0.1695	0.1938 (22b)											
Balanced mechanical ventilation with heat recovery																							
If mechanical ventilation:												0.5000 (23a)											
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												75.6500 (23c)											
Effective ac	0.3252	0.3155	0.3155	0.3010	0.3058	0.2913	0.2961	0.2864	0.2864	0.3010	0.2913	0.3155 (25)											

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Window (Uw = 1.20)			19.6300	1.1450	22.4771		(27)
External Wall	17.7100	2.4800	15.2300	0.1800	2.7414	140.0000	2132.2000 (29a)
Dormer Cheek	4.8100		4.8100	0.1800	0.8658	14.0000	67.3400 (29a)
Dormer Frontal Face	35.5800	17.1500	18.4300	0.1800	3.3174	14.0000	258.0200 (29a)
Flat HLR	44.9500		44.9500	0.1200	5.3940	9.0000	404.5500 (30)
Dormer Flat Roof	23.6000		23.6000	0.1200	2.8320	9.0000	212.4000 (30)
Total net area of external elements Aum(A, m ²)			126.6500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		37.6277		(33)
Wall to Dwelling			50.2800	0.0000	0.0000	70.0000	3519.6000 (32)
Party Floor			64.7400			80.0000	5179.2000 (32d)
Internal Wall			48.1600			9.0000	433.4400 (32c)
Heat capacity Cm = Sum (A x k)						(28)...(30) + (32) + (32a)...(32e) =	12206.7500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							188.5504 (35)
Thermal bridges (Default value 0.150 * total exposed area)							18.9975 (36)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF HEAT DEMAND 09 Jan 2014

Total fabric heat loss (33) + (36) = 56.6252 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	18.2021	17.6599	17.6599	16.8465	17.1176	16.3042	16.5754	16.0331	16.0331	16.8465	16.3042	17.6599	(38)
Heat transfer coeff	74.8273	74.2851	74.2851	73.4717	73.7428	72.9294	73.2006	72.6583	72.6583	73.4717	72.9294	74.2851	(39)
Average = Sum(39)m / 12 =												73.5621	(39)
HLP	1.1558	1.1474	1.1474	1.1349	1.1391	1.1265	1.1307	1.1223	1.1223	1.1349	1.1265	1.1474	(40)
HLP (average)												1.1363	(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													2.1120 (42)
Average daily hot water use (litres/day)													84.3601 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	92.7961	89.4217	86.0473	82.6729	79.2985	75.9241	75.9241	79.2985	82.6729	86.0473	89.4217	92.7961	(44)
Energy conte	137.6139	120.3580	124.1987	108.2794	103.8967	89.6549	83.0785	95.3338	96.4724	112.4292	122.7253	133.2717	(45)
Energy content (annual)													Total = Sum(45)m = 1327.3126 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
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	116.9718	102.3043	105.5689	92.0375	88.3122	76.2067	70.6167	81.0337	82.0015	95.5649	104.3165	113.2810	(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	116.9718	102.3043	105.5689	92.0375	88.3122	76.2067	70.6167	81.0337	82.0015	95.5649	104.3165	113.2810	(64)
RHI water heating demand													Total per year (kWh/year) = Sum(64)m = 1128.2157 (64)
Heat gains from water heating, kWh/month	29.2430	25.5761	26.3922	23.0094	22.0780	19.0517	17.6542	20.2584	20.5004	23.8912	26.0791	28.3202	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	41.1707	36.5674	29.7386	22.5141	16.8295	14.2082	15.3525	19.9557	26.7845	34.0091	39.6936	42.3150	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	275.7075	278.5685	271.3589	256.0105	236.6360	218.4267	206.2617	203.4008	210.6103	225.9587	245.3332	263.5425	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	(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)	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	(71)
Water heating gains (Table 5)	39.3051	38.0596	35.4734	31.9575	29.6748	26.4607	23.7287	27.2291	28.4727	32.1118	36.2210	38.0648	(72)
Total internal gains	448.2073	445.2196	428.5950	402.5062	375.1644	351.1196	337.3670	342.6096	357.8917	384.1037	413.2719	435.9464	(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
Northwest				19.6300	13.3498		0.7600		0.0000		0.7700		153.3553 (81)
Solar gains	153.3553	273.3590	498.4206	841.5357	1088.4670	1237.7398	1147.2730	934.8519	650.3299	367.2180	186.7385	119.7986	(83)
Total gains	601.5626	718.5786	927.0156	1244.0418	1463.6314	1588.8595	1484.6400	1277.4616	1008.2216	751.3217	600.0104	555.7451	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	45.3145	45.6453	45.6453	46.1506	45.9809	46.4938	46.3216	46.6673	46.6673	46.1506	46.4938	45.6453	
alpha	4.0210	4.0430	4.0430	4.0767	4.0654	4.0996	4.0881	4.1112	4.1112	4.0767	4.0996	4.0430	
util living area	0.9664	0.9361	0.8292	0.5967	0.3829	0.2109	0.1282	0.1592	0.3910	0.7536	0.9363	0.9738	(86)
MIT	20.1223	20.3062	20.6267	20.8643	20.9233	20.9334	20.9338	20.9341	20.9268	20.7949	20.4194	20.0784	(87)
Th 2	19.9555	19.9623	19.9623	19.9725	19.9691	19.9793	19.9759	19.9827	19.9827	19.9725	19.9793	19.9623	(88)
util rest of house	0.9584	0.9220	0.7979	0.5495	0.3334	0.1642	0.0777	0.1014	0.3209	0.6987	0.9194	0.9673	(89)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF HEAT DEMAND 09 Jan 2014

MIT 2	18.8149	19.0788	19.5107	19.8070	19.8639	19.8823	19.8789	19.8862	19.8820	19.7400	19.2569	18.7580 (90)
Living area fraction									fLA = Living area / (4) =			0.3732 (91)
MIT	19.3028	19.5368	19.9272	20.2015	20.2592	20.2746	20.2726	20.2773	20.2719	20.1337	19.6907	19.2507 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3028	19.5368	19.9272	20.2015	20.2592	20.2746	20.2726	20.2773	20.2719	20.1337	19.6907	19.2507 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9523	0.9153	0.7968	0.5603	0.3474	0.1777	0.0923	0.1181	0.3411	0.7080	0.9138	0.9618 (94)	
Useful gains	572.8630	657.7120	738.6125	697.0555	508.4679	282.3734	137.0651	150.9098	343.8819	531.9183	548.2871	534.5367 (95)	
Ext temp.	5.2000	5.7000	7.6000	10.2000	13.3000	16.4000	18.4000	18.2000	15.5000	11.9000	8.1000	5.2000 (96)	
Heat loss rate W													
	1055.2755	1027.8704	915.7253	734.8298	513.1946	282.5691	137.0724	150.9303	346.7196	604.9417	845.3044	1043.7601 (97)	
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)	
Space heating kWh													
	358.9149	248.7464	131.7720	27.1975	3.5167	0.0000	0.0000	0.0000	0.0000	54.3294	213.8525	378.8622 (98)	
Space heating													
RHI space heating demand												1417.1916 (98)	
												1417 (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	64.7400 (1b)	x 2.6200 (2b)	= 169.6188 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 169.6188 (5)

2. Ventilation rate

	main		secondary		other		total	m3 per hour				
	heating		heating									
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)			
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)			
Number of intermittent fans							0 * 10 =	0.0000	(7a)			
Number of passive vents							0 * 10 =	0.0000	(7b)			
Number of flueless gas fires							0 * 40 =	0.0000	(7c)			
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000	(8)			
Pressure test								Yes				
Measured/design AP50								5.0000				
Infiltration rate								0.2500	(18)			
Number of sides sheltered								3	(19)			
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.7750	(20)			
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1938	(21)			
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750
	0.2470	0.2422	0.2373	0.2131	0.2083	0.1841	0.1841	0.1792	0.1938	0.2083	0.2180	0.2277
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												75.6500
Effective ac	0.3688	0.3639	0.3591	0.3349	0.3300	0.3058	0.3058	0.3010	0.3155	0.3300	0.3397	0.3494

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	
Window (Uw = 1.20)			19.6300	1.1450	22.4771			(27)
External Wall	17.7100	2.4800	15.2300	0.1800	2.7414	140.0000	2132.2000	(29a)
Dormer Cheek	4.8100		4.8100	0.1800	0.8658	14.0000	67.3400	(29a)
Dormer Frontal Face	35.5800	17.1500	18.4300	0.1800	3.3174	14.0000	258.0200	(29a)
Flat HLR	44.9500		44.9500	0.1200	5.3940	9.0000	404.5500	(30)
Dormer Flat Roof	23.6000		23.6000	0.1200	2.8320	9.0000	212.4000	(30)
Total net area of external elements Aum(A, m2)			126.6500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	37.6277			(33)
Wall to Dwelling			50.2800	0.0000	0.0000	70.0000	3519.6000	(32)
Party Floor			64.7400			80.0000	5179.2000	(32d)
Internal Wall			48.1600			9.0000	433.4400	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		12206.7500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							188.5504	(35)
Thermal bridges (Default value 0.150 * total exposed area)							18.9975	(36)
Total fabric heat loss						(33) + (36) =	56.6252	(37)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1120 (42)
Average daily hot water use (litres/day)												84.3601 (43)
Daily hot water use	Jan 92.7961	Feb 89.4217	Mar 86.0473	Apr 82.6729	May 79.2985	Jun 75.9241	Jul 75.9241	Aug 79.2985	Sep 82.6729	Oct 86.0473	Nov 89.4217	Dec 92.7961 (44)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

Energy content (annual)	137.6139	120.3580	124.1987	108.2794	103.8967	89.6549	83.0785	95.3338	96.4724	112.4292	122.7253	133.2717 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1327.3126 (45)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
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												
Solar input	116.9718	102.3043	105.5689	92.0375	88.3122	76.2067	70.6167	81.0337	82.0015	95.5649	104.3165	113.2810 (62)
Solar input (sum of months) = Sum(63)m =	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	116.9718	102.3043	105.5689	92.0375	88.3122	76.2067	70.6167	81.0337	82.0015	95.5649	104.3165	113.2810 (64)
Heat gains from water heating, kWh/month	29.2430	25.5761	26.3922	23.0094	22.0780	19.0517	17.6542	20.2584	20.5004	23.8912	26.0791	28.3202 (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	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	41.1707	36.5674	29.7386	22.5141	16.8295	14.2082	15.3525	19.9557	26.7845	34.0091	39.6936	42.3150 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	275.7075	278.5685	271.3589	256.0105	236.6360	218.4267	206.2617	203.4008	210.6103	225.9587	245.3332	263.5425 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840 (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)	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801 (71)
Water heating gains (Table 5)	39.3051	38.0596	35.4734	31.9575	29.6748	26.4607	23.7287	27.2291	28.4727	32.1118	36.2210	38.0648 (72)
Total internal gains	448.2073	445.2196	428.5950	402.5062	375.1644	351.1196	337.3670	342.6096	357.8917	384.1037	413.2719	435.9464 (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

Northwest					19.6300	11.2829	0.7600	0.0000			0.7700			129.6125 (81)

Solar gains	129.6125	263.8300	475.3378	780.6412	1049.3350	1118.7021	1046.5229	834.3002	579.2065	322.4212	163.0861			105.8481 (83)
Total gains	577.8198	709.0497	903.9328	1183.1474	1424.4994	1469.8218	1383.8899	1176.9098	937.0982	706.5249	576.3580			541.7945 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	43.8835	44.0380	44.1936	44.9885	45.1509	45.9809	45.9809	46.1506	45.6453	45.1509	44.8272	44.5082
alpha	3.9256	3.9359	3.9462	3.9992	4.0101	4.0654	4.0654	4.0767	4.0430	4.0101	3.9885	3.9672
util living area	0.9760	0.9493	0.8713	0.6851	0.4755	0.3189	0.2340	0.2859	0.5243	0.8384	0.9568	0.9807 (86)
MIT	19.9597	20.1730	20.4961	20.7959	20.9042	20.9292	20.9325	20.9316	20.9044	20.6783	20.2598	19.9271 (87)
Th 2	19.9252	19.9286	19.9319	19.9488	19.9521	19.9691	19.9691	19.9725	19.9623	19.9521	19.9454	19.9386 (88)
util rest of house	0.9703	0.9382	0.8465	0.6420	0.4262	0.2684	0.1794	0.2226	0.4532	0.7980	0.9453	0.9761 (89)
MIT 2	18.5578	18.8635	19.3108	19.7054	19.8284	19.8688	19.8712	19.8744	19.8430	19.5800	19.0054	18.5212 (90)
Living area fraction									fLA = Living area / (4) =			0.3732 (91)
MIT	19.0810	19.3522	19.7531	20.1124	20.2299	20.2645	20.2673	20.2689	20.2391	19.9899	19.4735	19.0459 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0810	19.3522	19.7531	20.1124	20.2299	20.2645	20.2673	20.2689	20.2391	19.9899	19.4735	19.0459 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	557.4310	660.1068	761.0014	767.8480	626.0154	415.9176	270.1499	283.5965	442.9660	564.9582	541.2061	526.1640 (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	1142.0865	1112.7642	1016.8494	845.0704	640.5812	417.7172	270.4352	284.2549	456.0424	705.1644	935.9414	1131.0025 (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	434.9837	304.1858	190.3510	55.6002	10.8369	0.0000	0.0000	0.0000	0.0000	104.3134	284.2094	449.9998 (98)
Space heating												1834.4802 (98)
Space heating per m2										(98) / (4) =		28.3361 (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)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1834.4802 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	434.9837	304.1858	190.3510	55.6002	10.8369	0.0000	0.0000	0.0000	0.0000	104.3134	284.2094	449.9998	(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)	434.9837	304.1858	190.3510	55.6002	10.8369	0.0000	0.0000	0.0000	0.0000	104.3134	284.2094	449.9998	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	116.9718	102.3043	105.5689	92.0375	88.3122	76.2067	70.6167	81.0337	82.0015	95.5649	104.3165	113.2810	(64)
Efficiency of water heater (217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(216)
Fuel for water heating, kWh/month	116.9718	102.3043	105.5689	92.0375	88.3122	76.2067	70.6167	81.0337	82.0015	95.5649	104.3165	113.2810	(219)
Water heating fuel used												1128.2157	(219)
Annual totals kWh/year													
Space heating fuel - main system												1834.4802	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 1.4125)													
mechanical ventilation fans (SFP = 1.4125)													292.2956 (230a)
Total electricity for the above, kWh/year													292.2956 (231)
Electricity for lighting (calculated in Appendix L)													290.8350 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 2.10 * 1080 * 1.00) =										-1813.6014		-1813.6014	(233)
Total delivered energy for all uses												1732.2252	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1834.4802	6.6100	121.2591 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1128.2157	6.6100	74.5751 (247)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Energy for lighting	290.8350	13.1900	38.3611 (250)
Additional standing charges			70.0000 (251)
Energy saving/generation technologies			
PV Unit	-1813.6014	13.1900	-239.2140 (252)
Total energy cost			64.9813 (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] =	0.2487 (257)
SAP value		96.5307
SAP rating (Section 12)		97 (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	1834.4802	0.5190	952.0952 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1128.2157	0.5190	585.5440 (264)
Space and water heating			1537.6392 (265)
Pumps and fans	292.2956	0.5190	151.7014 (267)
Energy for lighting	290.8350	0.5190	150.9433 (268)
Energy saving/generation technologies			
PV Unit	-1813.6014	0.5190	-941.2591 (269)
Total kg/year			899.0249 (272)
CO2 emissions per m2			13.8900 (273)
EI value			89.0223
EI rating			89 (274)
EI band			B

Calculation of stars for heating and DHW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

Main heating energy efficiency	$6.61 \times (1 + 0.29 \times 0.25) / 1.0000 = 7.089$, stars = 3
Main heating environmental impact	$0.519 \times (1 + 0.29 \times 0.25) / 1.0000 = 0.5566$, stars = 1
Water heating energy efficiency	$6.61 / 1.0000 = 6.610$, stars = 3
Water heating environmental impact	$0.519 / 1.0000 = 0.5190$, stars = 2

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	64.7400 (1b)	x 2.6200 (2b)	= 169.6188 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 169.6188 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					0.0000 / (5) = 0.0000 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.2500 (18)
					3 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.1938 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.8000	3.5000	3.6000	3.4000	3.4000	3.7000	3.5000	4.0000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9500	0.8750	0.9000	0.8500	0.8500	0.9250	0.8750	1.0000 (22a)
Adj infilt rate	0.2034	0.1938	0.1938	0.1792	0.1841	0.1695	0.1744	0.1647	0.1647	0.1792	0.1695	0.1938 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												75.6500 (23c)
Effective ac	0.3252	0.3155	0.3155	0.3010	0.3058	0.2913	0.2961	0.2864	0.2864	0.3010	0.2913	0.3155 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Window (Uw = 1.20)			19.6300	1.1450	22.4771		(27)
External Wall	17.7100	2.4800	15.2300	0.1800	2.7414	140.0000	2132.2000 (29a)
Dormer Cheek	4.8100		4.8100	0.1800	0.8658	14.0000	67.3400 (29a)
Dormer Frontal Face	35.5800	17.1500	18.4300	0.1800	3.3174	14.0000	258.0200 (29a)
Flat HLR	44.9500		44.9500	0.1200	5.3940	9.0000	404.5500 (30)
Dormer Flat Roof	23.6000		23.6000	0.1200	2.8320	9.0000	212.4000 (30)
Total net area of external elements Aum(A, m ²)			126.6500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	37.6277		(33)
Wall to Dwelling			50.2800	0.0000	0.0000	70.0000	3519.6000 (32)
Party Floor			64.7400			80.0000	5179.2000 (32d)
Internal Wall			48.1600			9.0000	433.4400 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 12206.7500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							188.5504 (35)
Thermal bridges (Default value 0.150 * total exposed area)							18.9975 (36)
Total fabric heat loss							(33) + (36) = 56.6252 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	18.2021	17.6599	17.6599	16.8465	17.1176	16.3042	16.5754	16.0331	16.0331	16.8465	16.3042	17.6599 (38)
Heat transfer coeff	74.8273	74.2851	74.2851	73.4717	73.7428	72.9294	73.2006	72.6583	72.6583	73.4717	72.9294	74.2851 (39)
Average = Sum(39)m / 12 =												73.5621 (39)
HLP	1.1558	1.1474	1.1474	1.1349	1.1391	1.1265	1.1307	1.1223	1.1223	1.1349	1.1265	1.1474 (40)
HLP (average)												1.1363 (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												2.1120 (42)
Average daily hot water use (litres/day)												84.3601 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	92.7961	89.4217	86.0473	82.6729	79.2985	75.9241	75.9241	79.2985	82.6729	86.0473	89.4217	92.7961 (44)



FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

Energy conte	137.6139	120.3580	124.1987	108.2794	103.8967	89.6549	83.0785	95.3338	96.4724	112.4292	122.7253	133.2717 (45)
Energy content (annual)										Total = Sum (45)m =		1327.3126 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
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												
Solar input	116.9718	102.3043	105.5689	92.0375	88.3122	76.2067	70.6167	81.0337	82.0015	95.5649	104.3165	113.2810 (62)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
								Solar input (sum of months) = Sum (63)m =				0.0000 (63)
Output from w/h	116.9718	102.3043	105.5689	92.0375	88.3122	76.2067	70.6167	81.0337	82.0015	95.5649	104.3165	113.2810 (64)
								Total per year (kWh/year) = Sum (64)m =				1128.2157 (64)
Heat gains from water heating, kWh/month	29.2430	25.5761	26.3922	23.0094	22.0780	19.0517	17.6542	20.2584	20.5004	23.8912	26.0791	28.3202 (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	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	41.1707	36.5674	29.7386	22.5141	16.8295	14.2082	15.3525	19.9557	26.7845	34.0091	39.6936	42.3150 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	275.7075	278.5685	271.3589	256.0105	236.6360	218.4267	206.2617	203.4008	210.6103	225.9587	245.3332	263.5425 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840 (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)	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801 (71)
Water heating gains (Table 5)	39.3051	38.0596	35.4734	31.9575	29.6748	26.4607	23.7287	27.2291	28.4727	32.1118	36.2210	38.0648 (72)
Total internal gains	448.2073	445.2196	428.5950	402.5062	375.1644	351.1196	337.3670	342.6096	357.8917	384.1037	413.2719	435.9464 (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		
-----				-----				-----				-----			
Northwest				19.6300		13.3498		0.7600		0.0000		0.7700		153.3553 (81)	
-----				-----				-----				-----			
Solar gains	153.3553	273.3590	498.4206	841.5357	1088.4670	1237.7398	1147.2730	934.8519	650.3299	367.2180	186.7385	119.7986	(83)		
Total gains	601.5626	718.5786	927.0156	1244.0418	1463.6314	1588.8595	1484.6400	1277.4616	1008.2216	751.3217	600.0104	555.7451	(84)		

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	45.3145	45.6453	45.6453	46.1506	45.9809	46.4938	46.3216	46.6673	46.6673	46.1506	46.4938	45.6453
alpha	4.0210	4.0430	4.0430	4.0767	4.0654	4.0996	4.0881	4.1112	4.1112	4.0767	4.0996	4.0430
util living area	0.9664	0.9361	0.8292	0.5967	0.3829	0.2109	0.1282	0.1592	0.3910	0.7536	0.9363	0.9738 (86)
MIT	20.1223	20.3062	20.6267	20.8643	20.9233	20.9334	20.9338	20.9341	20.9268	20.7949	20.4194	20.0784 (87)
Th 2	19.9555	19.9623	19.9623	19.9725	19.9691	19.9793	19.9759	19.9827	19.9827	19.9725	19.9793	19.9623 (88)
util rest of house	0.9584	0.9220	0.7979	0.5495	0.3334	0.1642	0.0777	0.1014	0.3209	0.6987	0.9194	0.9673 (89)
MIT 2	18.8149	19.0788	19.5107	19.8070	19.8639	19.8823	19.8789	19.8862	19.8820	19.7400	19.2569	18.7580 (90)
Living area fraction									fLA = Living area / (4) =			0.3732 (91)
MIT	19.3028	19.5368	19.9272	20.2015	20.2592	20.2746	20.2726	20.2773	20.2719	20.1337	19.6907	19.2507 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3028	19.5368	19.9272	20.2015	20.2592	20.2746	20.2726	20.2773	20.2719	20.1337	19.6907	19.2507 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9523	0.9153	0.7968	0.5603	0.3474	0.1777	0.0923	0.1181	0.3411	0.7080	0.9138	0.9618 (94)
Useful gains	572.8630	657.7120	738.6125	697.0555	508.4679	282.3734	137.0651	150.9098	343.8819	531.9183	548.2871	534.5367 (95)
Ext temp.	5.2000	5.7000	7.6000	10.2000	13.3000	16.4000	18.4000	18.2000	15.5000	11.9000	8.1000	5.2000 (96)
Heat loss rate W	1055.2755	1027.8704	915.7253	734.8298	513.1946	282.5691	137.0724	150.9303	346.7196	604.9417	845.3044	1043.7601 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	358.9149	248.7464	131.7720	27.1975	3.5167	0.0000	0.0000	0.0000	0.0000	54.3294	213.8525	378.8622 (98)
Space heating												1417.1916 (98)
Space heating per m2										(98) / (4) =		21.8905 (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)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1417.1916 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	358.9149	248.7464	131.7720	27.1975	3.5167	0.0000	0.0000	0.0000	0.0000	54.3294	213.8525	378.8622	(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)	358.9149	248.7464	131.7720	27.1975	3.5167	0.0000	0.0000	0.0000	0.0000	54.3294	213.8525	378.8622	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	116.9718	102.3043	105.5689	92.0375	88.3122	76.2067	70.6167	81.0337	82.0015	95.5649	104.3165	113.2810	(64)
Efficiency of water heater (217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(216)
Fuel for water heating, kWh/month	116.9718	102.3043	105.5689	92.0375	88.3122	76.2067	70.6167	81.0337	82.0015	95.5649	104.3165	113.2810	(219)
Water heating fuel used												1128.2157	(219)
Annual totals kWh/year													
Space heating fuel - main system												1417.1916	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 1.4125)													
mechanical ventilation fans (SFP = 1.4125)													292.2956 (230a)
Total electricity for the above, kWh/year													292.2956 (231)
Electricity for lighting (calculated in Appendix L)													290.8350 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 2.10 * 1151 * 1.00) =										-1934.3259		-1934.3259	(233)
Total delivered energy for all uses												1194.2120	(238)

10a. Fuel costs - using BEDF prices (483)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1417.1916	12.2200	173.1808 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1128.2157	12.2200	137.8680 (247)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Energy for lighting	290.8350	19.1200	55.6076 (250)
Additional standing charges			9.0000 (251)
Energy saving/generation technologies			
PV Unit	-1934.3259	19.1200	-369.8431 (252)
Total energy cost			5.8133 (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	1417.1916	0.5190	735.5224 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1128.2157	0.5190	585.5440 (264)
Space and water heating			1321.0664 (265)
Pumps and fans	292.2956	0.5190	151.7014 (267)
Energy for lighting	290.8350	0.5190	150.9433 (268)
Energy saving/generation technologies			
PV Unit	-1934.3259	0.5190	-1003.9151 (269)
Total kg/year			619.7960 (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	1417.1916	3.0700	4350.7781 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1128.2157	3.0700	3463.6223 (264)
Space and water heating			7814.4004 (265)
Pumps and fans	292.2956	3.0700	897.3475 (267)
Energy for lighting	290.8350	3.0700	892.8633 (268)
Energy saving/generation technologies			
PV Unit	-1934.3259	3.0700	-5938.3804 (269)
Primary energy kWh/year			3666.2308 (272)
Primary energy kWh/m2/year			56.6301 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: A 97
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	Recommended
O	Not considered
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U Solar photovoltaic panels	Already installed
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
N Solar water heating	+ 2.1	-£ 78	-345 kg (55.6%)

Recommended measures	Typical annual savings		Energy efficiency	Environmental impact
Solar water heating	£78	5.32 kg/m²	A 99	A 93
Total Savings	£78	5.32 kg/m²		

Potential energy efficiency rating: A 99
Potential environmental impact rating: A 93

Fuel prices for cost data on this page from database revision number 483 TEST (30 Sep 2021)
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	£376	£298	£78
Space heating	£182	£182	£0
Water heating	£138	£60	£78
Lighting	£56	£56	£0
Generated (PV)	-£370	-£370	£0
Total cost of fuels	£6	-£72	£78
Total cost of uses	£6	-£72	£78
Delivered energy	18 kWh/m²	8 kWh/m²	10 kWh/m²
Carbon dioxide emissions	0.6 tonnes	0.3 tonnes	0.3 tonnes
CO2 emissions per m²	10 kg/m²	4 kg/m²	5 kg/m²
Primary energy	57 kWh/m²	25 kWh/m²	31 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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	64.7400 (1b)	x 2.6200 (2b)	= 169.6188 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 169.6188 (5)

2. Ventilation rate

	main		secondary		other		total		m3 per hour			
	heating		heating									
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)			
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)			
Number of intermittent fans							0 * 10 =	0.0000	(7a)			
Number of passive vents							0 * 10 =	0.0000	(7b)			
Number of flueless gas fires							0 * 40 =	0.0000	(7c)			
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000	(8)			
Pressure test								Yes				
Measured/design AP50								5.0000				
Infiltration rate								0.2500	(18)			
Number of sides sheltered								3	(19)			
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.7750	(20)			
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1938	(21)			
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.2470	0.2422	0.2373	0.2131	0.2083	0.1841	0.1841	0.1792	0.1938	0.2083	0.2180	0.2277 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												75.6500 (23c)
Effective ac	0.3688	0.3639	0.3591	0.3349	0.3300	0.3058	0.3058	0.3010	0.3155	0.3300	0.3397	0.3494 (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	
Window (Uw = 1.20)			19.6300	1.1450	22.4771			(27)
External Wall	17.7100	2.4800	15.2300	0.1800	2.7414	140.0000	2132.2000	(29a)
Dormer Cheek	4.8100		4.8100	0.1800	0.8658	14.0000	67.3400	(29a)
Dormer Frontal Face	35.5800	17.1500	18.4300	0.1800	3.3174	14.0000	258.0200	(29a)
Flat HLR	44.9500		44.9500	0.1200	5.3940	9.0000	404.5500	(30)
Dormer Flat Roof	23.6000		23.6000	0.1200	2.8320	9.0000	212.4000	(30)
Total net area of external elements Aum(A, m2)			126.6500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...	(30) + (32) =	37.6277			(33)
Wall to Dwelling			50.2800	0.0000	0.0000	70.0000	3519.6000	(32)
Party Floor			64.7400			80.0000	5179.2000	(32d)
Internal Wall			48.1600			9.0000	433.4400	(32c)
Heat capacity Cm = Sum(A x k)					(28)...	(30) + (32) + (32a)...	(32e) =	12206.7500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								188.5504 (35)
Thermal bridges (Default value 0.150 * total exposed area)								18.9975 (36)
Total fabric heat loss						(33) + (36) =		56.6252 (37)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1120 (42)
Average daily hot water use (litres/day)												84.3601 (43)
Daily hot water use	Jan 92.7961	Feb 89.4217	Mar 86.0473	Apr 82.6729	May 79.2985	Jun 75.9241	Jul 75.9241	Aug 79.2985	Sep 82.6729	Oct 86.0473	Nov 89.4217	Dec 92.7961 (44)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Energy content (annual)	137.6139	120.3580	124.1987	108.2794	103.8967	89.6549	83.0785	95.3338	96.4724	112.4292	122.7253	133.2717 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1327.3126 (45)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
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	116.9718	102.3043	105.5689	92.0375	88.3122	76.2067	70.6167	81.0337	82.0015	95.5649	104.3165	113.2810 (62)
Aperture area of solar collector												3.0000 (H1)
Zero-loss collector efficiency												0.7000 (H2)
Collector heat loss coefficient												1.8000 (H3)
Collector 2nd order heat loss coefficient												0.0050 (H3a)
Collector effective heat loss coefficient												1.8063 (H3b)
Collector performance ratio												2.5804 (H4)
Annual solar radiation per m2												1079.5246 (H5)
Overshading factor												0.8000 (H6)
Solar energy available												1813.6014 (H7)
Adjustment factor for showers												1.0000 (H7a)
Solar-to-load ratio												1.3664 (H8)
Utilisation factor												0.5190 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												84.3601 (H14)
Volume ratio Veff/V												0.8890 (H15)
Solar storage volume factor												0.9765 (H16)
Solar input												-808.1590 (H17)
Solar input	-23.4350	-39.1063	-66.6025	-89.2604	-110.2738	-108.4167	-106.9839	-93.4724	-73.2076	-49.9922	-27.7973	-19.6111 (63)
Solar input (sum of months) = Sum (63)m =												-808.1590 (63)
Output from w/h	93.5368	63.1980	38.9664	2.7771	0.0000	0.0000	0.0000	0.0000	8.7939	45.5727	76.5192	93.6699 (64)
Total per year (kWh/year) = Sum (64)m =												423.0340 (64)
Heat gains from water heating, kWh/month	29.2430	25.5761	26.3922	23.0094	22.0780	19.0517	17.6542	20.2584	20.5004	23.8912	26.0791	28.3202 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	41.1707	36.5674	29.7386	22.5141	16.8295	14.2082	15.3525	19.9557	26.7845	34.0091	39.6936	42.3150 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	275.7075	278.5685	271.3589	256.0105	236.6360	218.4267	206.2617	203.4008	210.6103	225.9587	245.3332	263.5425 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840 (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)	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801 (71)
Water heating gains (Table 5)	39.3051	38.0596	35.4734	31.9575	29.6748	26.4607	23.7287	27.2291	28.4727	32.1118	36.2210	38.0648 (72)
Total internal gains	448.2073	445.2196	428.5950	402.5062	375.1644	351.1196	337.3670	342.6096	357.8917	384.1037	413.2719	435.9464 (73)

6. Solar gains

[Jan]												
Area	19.6300											
Solar flux	11.2829											
Specific data	0.7600											
FF	0.0000											
Access factor	0.7700											
Gains	129.6125											81)
Solar gains	129.6125	263.8300	475.3378	780.6412	1049.3350	1118.7021	1046.5229	834.3002	579.2065	322.4212	163.0861	105.8481 (83)
Total gains	577.8198	709.0497	903.9328	1183.1474	1424.4994	1469.8218	1383.8899	1176.9098	937.0982	706.5249	576.3580	541.7945 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
Jan	43.8835	44.0380	44.1936	44.9885	45.1509	45.9809	45.9809	46.1506	45.6453	45.1509	44.8272	44.5082
alpha	3.9256	3.9359	3.9462	3.9992	4.0101	4.0654	4.0654	4.0767	4.0430	4.0101	3.9885	3.9672
util living area	0.9760	0.9493	0.8713	0.6851	0.4755	0.3189	0.2340	0.2859	0.5243	0.8384	0.9568	0.9807 (86)
MIT	19.9597	20.1730	20.4961	20.7959	20.9042	20.9292	20.9325	20.9316	20.9044	20.6783	20.2598	19.9271 (87)
Th 2	19.9252	19.9286	19.9319	19.9488	19.9521	19.9691	19.9691	19.9725	19.9623	19.9521	19.9454	19.9386 (88)
util rest of house	0.9703	0.9382	0.8465	0.6420	0.4262	0.2684	0.1794	0.2226	0.4532	0.7980	0.9453	0.9761 (89)
MIT 2	18.5578	18.8635	19.3108	19.7054	19.8284	19.8688	19.8712	19.8744	19.8430	19.5800	19.0054	18.5212 (90)
Living area fraction									fLA = Living area / (4) =			0.3732 (91)
MIT	19.0810	19.3522	19.7531	20.1124	20.2299	20.2645	20.2673	20.2689	20.2391	19.9899	19.4735	19.0459 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0810	19.3522	19.7531	20.1124	20.2299	20.2645	20.2673	20.2689	20.2391	19.9899	19.4735	19.0459 (93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9647	0.9310	0.8419	0.6490	0.4395	0.2830	0.1952	0.2410	0.4727	0.7996	0.9390	0.9712	(94)
Useful gains	557.4310	660.1068	761.0014	767.8480	626.0154	415.9176	270.1499	283.5965	442.9660	564.9582	541.2061	526.1640	(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	1142.0865	1112.7642	1016.8494	845.0704	640.5812	417.7172	270.4352	284.2549	456.0424	705.1644	935.9414	1131.0025	(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	434.9837	304.1858	190.3510	55.6002	10.8369	0.0000	0.0000	0.0000	0.0000	104.3134	284.2094	449.9998	(98)
Space heating												1834.4802	(98)
Space heating per m2												28.3361	(99)
											(98) / (4) =		

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													100.0000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													1834.4802	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	434.9837	304.1858	190.3510	55.6002	10.8369	0.0000	0.0000	0.0000	0.0000	104.3134	284.2094	449.9998	(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)	434.9837	304.1858	190.3510	55.6002	10.8369	0.0000	0.0000	0.0000	0.0000	104.3134	284.2094	449.9998	(211)	
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)	
Water heating														
Water heating requirement	93.5368	63.1980	38.9664	2.7771	0.0000	0.0000	0.0000	0.0000	8.7939	45.5727	76.5192	93.6699	(64)	
Efficiency of water heater													100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)	
Fuel for water heating, kWh/month	93.5368	63.1980	38.9664	2.7771	0.0000	0.0000	0.0000	0.0000	8.7939	45.5727	76.5192	93.6699	(219)	
Water heating fuel used													423.0340	(219)
Annual totals kWh/year														
Space heating fuel - main system													1834.4802	(211)
Space heating fuel - secondary													0.0000	(215)
Electricity for pumps and fans:														
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 1.4125)														
mechanical ventilation fans (SFP = 1.4125)													292.2956	(230a)
pump for solar water heating													50.0000	(230g)
Total electricity for the above, kWh/year													342.2956	(231)
Electricity for lighting (calculated in Appendix L)													290.8350	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 2.10 * 1080 * 1.00) =										-1813.6014			-1813.6014	(233)
Total delivered energy for all uses													1077.0435	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1834.4802	6.6100	121.2591	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	423.0340	6.6100	27.9626	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Pump for solar water heating	50.0000	13.1900	6.5950	(249)
Energy for lighting	290.8350	13.1900	38.3611	(250)
Additional standing charges			70.0000	(251)
Energy saving/generation technologies				
PV Unit	-1813.6014	13.1900	-239.2140	(252)
Total energy cost			24.9638	(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] =	0.0955	(257)
SAP value			98.6672	
SAP rating (Section 12)			99	(258)
SAP band			A	

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

Energy	Emission factor	Emissions
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FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

	kWh/year	kg CO2/kWh	kg CO2/year	
Space heating - main system 1	1834.4802	0.5190	952.0952	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	423.0340	0.5190	219.5547	(264)
Space and water heating			1171.6499	(265)
Pumps and fans	342.2956	0.5190	177.6514	(267)
Energy for lighting	290.8350	0.5190	150.9433	(268)
Energy saving/generation technologies				
PV Unit	-1813.6014	0.5190	-941.2591	(269)
Total kg/year			558.9856	(272)
CO2 emissions per m2			8.6300	(273)
EI value			93.1744	
EI rating			93	(274)
EI band			A	

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	64.7400 (1b)	x 2.6200 (2b)	= 169.6188 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 169.6188 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour							
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)							
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)							
Number of intermittent fans					0 * 10 = 0.0000 (7a)							
Number of passive vents					0 * 10 = 0.0000 (7b)							
Number of flueless gas fires					0 * 40 = 0.0000 (7c)							
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)							
Pressure test					Yes							
Measured/design AP50					5.0000							
Infiltration rate					0.2500 (18)							
Number of sides sheltered					3 (19)							
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)							
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1938 (21)							
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	4.2000	4.0000	4.0000	3.7000	3.8000	3.5000	3.6000	3.4000	3.4000	3.7000	3.5000	4.0000 (22)
Adj infilt rate	1.0500	1.0000	1.0000	0.9250	0.9500	0.8750	0.9000	0.8500	0.8500	0.9250	0.8750	1.0000 (22a)
	0.2034	0.1938	0.1938	0.1792	0.1841	0.1695	0.1744	0.1647	0.1647	0.1792	0.1695	0.1938 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												75.6500 (23c)
Effective ac	0.3252	0.3155	0.3155	0.3010	0.3058	0.2913	0.2961	0.2864	0.2864	0.3010	0.2913	0.3155 (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	
Window (Uw = 1.20)			19.6300	1.1450	22.4771			(27)
External Wall	17.7100	2.4800	15.2300	0.1800	2.7414	140.0000	2132.2000	(29a)
Dormer Cheek	4.8100		4.8100	0.1800	0.8658	14.0000	67.3400	(29a)
Dormer Frontal Face	35.5800	17.1500	18.4300	0.1800	3.3174	14.0000	258.0200	(29a)
Flat HLR	44.9500		44.9500	0.1200	5.3940	9.0000	404.5500	(30)
Dormer Flat Roof	23.6000		23.6000	0.1200	2.8320	9.0000	212.4000	(30)
Total net area of external elements Aum(A, m2)			126.6500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	37.6277			(33)
Wall to Dwelling			50.2800	0.0000	0.0000	70.0000	3519.6000	(32)
Party Floor			64.7400			80.0000	5179.2000	(32d)
Internal Wall			48.1600			9.0000	433.4400	(32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	12206.7500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							188.5504	(35)
Thermal bridges (Default value 0.150 * total exposed area)							18.9975	(36)
Total fabric heat loss						(33) + (36) =	56.6252	(37)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1120 (42)
Average daily hot water use (litres/day)												84.3601 (43)
Daily hot water use	Jan 92.7961	Feb 89.4217	Mar 86.0473	Apr 82.6729	May 79.2985	Jun 75.9241	Jul 75.9241	Aug 79.2985	Sep 82.6729	Oct 86.0473	Nov 89.4217	Dec 92.7961 (44)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

Energy content (annual)	137.6139	120.3580	124.1987	108.2794	103.8967	89.6549	83.0785	95.3338	96.4724	112.4292	122.7253	133.2717 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1327.3126 (45)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
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	116.9718	102.3043	105.5689	92.0375	88.3122	76.2067	70.6167	81.0337	82.0015	95.5649	104.3165	113.2810 (62)
Aperture area of solar collector												3.0000 (H1)
Zero-loss collector efficiency												0.7000 (H2)
Collector heat loss coefficient												1.8000 (H3)
Collector 2nd order heat loss coefficient												0.0050 (H3a)
Collector effective heat loss coefficient												1.8063 (H3b)
Collector performance ratio												2.5804 (H4)
Annual solar radiation per m2												1151.3844 (H5)
Overshading factor												0.8000 (H6)
Solar energy available												1934.3259 (H7)
Adjustment factor for showers												1.0000 (H7a)
Solar-to-load ratio												1.4573 (H8)
Utilisation factor												0.4965 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												84.3601 (H14)
Volume ratio Veff/V												0.8890 (H15)
Solar storage volume factor												0.9765 (H16)
Solar input												-824.6185 (H17)
Solar input	-25.9312	-37.7218	-64.8407	-89.5438	-106.9299	-112.4351	-109.7994	-97.6372	-76.3421	-52.9248	-29.7220	-20.7906 (63)
Solar input (sum of months) = Sum (63)m =												-824.6185 (63)
Output from w/h	91.0407	64.5825	40.7282	2.4938	0.0000	0.0000	0.0000	0.0000	5.6594	42.6400	74.5945	92.4904 (64)
Total per year (kWh/year) = Sum (64)m =												414.2295 (64)
Heat gains from water heating, kWh/month	29.2430	25.5761	26.3922	23.0094	22.0780	19.0517	17.6542	20.2584	20.5004	23.8912	26.0791	28.3202 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	41.1707	36.5674	29.7386	22.5141	16.8295	14.2082	15.3525	19.9557	26.7845	34.0091	39.6936	42.3150 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	275.7075	278.5685	271.3589	256.0105	236.6360	218.4267	206.2617	203.4008	210.6103	225.9587	245.3332	263.5425 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840 (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)	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801 (71)
Water heating gains (Table 5)	39.3051	38.0596	35.4734	31.9575	29.6748	26.4607	23.7287	27.2291	28.4727	32.1118	36.2210	38.0648 (72)
Total internal gains	448.2073	445.2196	428.5950	402.5062	375.1644	351.1196	337.3670	342.6096	357.8917	384.1037	413.2719	435.9464 (73)

6. Solar gains

[Jan]												
Area	19.6300											
Solar flux	13.3498											
Specific data	0.7600											
Specific data	0.0000											
Access factor	0.7700											
Gains	153.3553											153.3553 (81)
Solar gains	153.3553	273.3590	498.4206	841.5357	1088.4670	1237.7398	1147.2730	934.8519	650.3299	367.2180	186.7385	119.7986 (83)
Total gains	601.5626	718.5786	927.0156	1244.0418	1463.6314	1588.8595	1484.6400	1277.4616	1008.2216	751.3217	600.0104	555.7451 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
Jan	45.3145	45.6453	45.6453	46.1506	45.9809	46.4938	46.3216	46.6673	46.6673	46.1506	46.4938	45.6453
alpha	4.0210	4.0430	4.0430	4.0767	4.0654	4.0996	4.0881	4.1112	4.1112	4.0767	4.0996	4.0430
util living area	0.9664	0.9361	0.8292	0.5967	0.3829	0.2109	0.1282	0.1592	0.3910	0.7536	0.9363	0.9738 (86)
MIT	20.1223	20.3062	20.6267	20.8643	20.9233	20.9334	20.9338	20.9341	20.9268	20.7949	20.4194	20.0784 (87)
Th 2	19.9555	19.9623	19.9623	19.9725	19.9691	19.9793	19.9759	19.9827	19.9827	19.9725	19.9793	19.9623 (88)
util rest of house	0.9584	0.9220	0.7979	0.5495	0.3334	0.1642	0.0777	0.1014	0.3209	0.6987	0.9194	0.9673 (89)
MIT 2	18.8149	19.0788	19.5107	19.8070	19.8639	19.8823	19.8789	19.8862	19.8820	19.7400	19.2569	18.7580 (90)
Living area fraction												0.3732 (91)
MIT	19.3028	19.5368	19.9272	20.2015	20.2592	20.2746	20.2726	20.2773	20.2719	20.1337	19.6907	19.2507 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3028	19.5368	19.9272	20.2015	20.2592	20.2746	20.2726	20.2773	20.2719	20.1337	19.6907	19.2507 (93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9523	0.9153	0.7968	0.5603	0.3474	0.1777	0.0923	0.1181	0.3411	0.7080	0.9138	0.9618	(94)
Useful gains	572.8630	657.7120	738.6125	697.0555	508.4679	282.3734	137.0651	150.9098	343.8819	531.9183	548.2871	534.5367	(95)
Ext temp.	5.2000	5.7000	7.6000	10.2000	13.3000	16.4000	18.4000	18.2000	15.5000	11.9000	8.1000	5.2000	(96)
Heat loss rate W	1055.2755	1027.8704	915.7253	734.8298	513.1946	282.5691	137.0724	150.9303	346.7196	604.9417	845.3044	1043.7601	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	358.9149	248.7464	131.7720	27.1975	3.5167	0.0000	0.0000	0.0000	0.0000	54.3294	213.8525	378.8622	(98)
Space heating												1417.1916	(98)
Space heating per m2											(98) / (4) =	21.8905	(99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													100.0000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													1417.1916	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	358.9149	248.7464	131.7720	27.1975	3.5167	0.0000	0.0000	0.0000	0.0000	54.3294	213.8525	378.8622	(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)	358.9149	248.7464	131.7720	27.1975	3.5167	0.0000	0.0000	0.0000	0.0000	54.3294	213.8525	378.8622	(211)	
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)	
Water heating														
Water heating requirement	91.0407	64.5825	40.7282	2.4938	0.0000	0.0000	0.0000	0.0000	5.6594	42.6400	74.5945	92.4904	(64)	
Efficiency of water heater	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(216)	
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)	
Fuel for water heating, kWh/month	91.0407	64.5825	40.7282	2.4938	0.0000	0.0000	0.0000	0.0000	5.6594	42.6400	74.5945	92.4904	(219)	
Water heating fuel used												414.2295	(219)	
Annual totals kWh/year												1417.1916	(211)	
Space heating fuel - main system												1417.1916	(211)	
Space heating fuel - secondary												0.0000	(215)	
Electricity for pumps and fans:														
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 1.4125)														
mechanical ventilation fans (SFP = 1.4125)													292.2956	(230a)
pump for solar water heating													50.0000	(230g)
Total electricity for the above, kWh/year													342.2956	(231)
Electricity for lighting (calculated in Appendix L)													290.8350	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 2.10 * 1151 * 1.00) =									-1934.3259			-1934.3259	(233)	
Total delivered energy for all uses												530.2258	(238)	

10a. Fuel costs - using BEDF prices (483)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1417.1916	12.2200	173.1808	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	414.2295	12.2200	50.6188	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Pump for solar water heating	50.0000	19.1200	9.5600	(249)
Energy for lighting	290.8350	19.1200	55.6076	(250)
Additional standing charges			9.0000	(251)
Energy saving/generation technologies				
PV Unit	-1934.3259	19.1200	-369.8431	(252)
Total energy cost			-71.8758	(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	1417.1916	0.5190	735.5224	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	414.2295	0.5190	214.9851	(264)
Space and water heating			950.5075	(265)
Pumps and fans	342.2956	0.5190	177.6514	(267)
Energy for lighting	290.8350	0.5190	150.9433	(268)
Energy saving/generation technologies				
PV Unit	-1934.3259	0.5190	-1003.9151	(269)
Total kg/year			275.1872	(272)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

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	1417.1916	3.0700	4350.7781	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	414.2295	3.0700	1271.6846	(264)
Space and water heating			5622.4628	(265)
Pumps and fans	342.2956	3.0700	1050.8475	(267)
Energy for lighting	290.8350	3.0700	892.8633	(268)
Energy saving/generation technologies				
PV Unit	-1934.3259	3.0700	-5938.3804	(269)
Primary energy kWh/year			1627.7932	(272)
Primary energy kWh/m2/year			25.1435	(273)

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Designed)



Property Reference	210928				Issued on Date	20/10/2021
Assessment Reference	APARTMENT 3.04			Prop Type Ref	APARTMENT 3.04	
Property	UB7 7QR					
SAP Rating	97 A	DER	17.43	TER	28.29	
Environmental	89 B	% DER<TER	38.40			
CO ₂ Emissions (t/year)	0.62	DFEE	51.63	TFEE	54.21	
General Requirements Compliance	Fail	% DFEE<TFEE	4.76			
Assessor Details	Mr. Dion Mellows, SHA Environmental Limited, Tel: 02036370427, info@shaenvironmental.co.uk				Assessor ID	G297-0001
Client						

SUMMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Electricity		
Fuel factor	1.55 (electricity)		
Target Carbon Dioxide Emission Rate (TER)	28.29	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	17.43	kgCO ₂ /m ²	Pass
	-10.86 (-38.4%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	54.21	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	51.63	kWh/m ² /yr	
	-2.6 (-4.8%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Roof	0.12 (max. 0.20)	0.12 (max. 0.35)	Pass
Openings	1.20 (max. 2.00)	1.20 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated using default γ -value of 0.15

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system	Electric underfloor heating - Electric Underfloor heating in thin screed (standard tariff)	
Secondary heating system	None	

5 Cylinder insulation

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Designed)



Hot water storage

No cylinder

6 Controls

Space heating controls

Time and temperature zone control

Pass

Hot water controls

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100

%

Minimum

75

%

Pass

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power

1.13

Maximum

1.5

Pass

MVHR efficiency

89

%

Minimum

70

%

Pass

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)

High

Fail

Based on:

Overshading

Average

Windows facing North West

19.63 m², No overhang

Air change rate

4.00 ach

Blinds/curtains

Dark-coloured curtain or roller blind, closed 50% of daylight hours

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

5.00 (design value)

Maximum

10.0

Pass

10 Key features

Party wall U-value

0.00

W/m²K

Roof U-value

0.12

W/m²K

Roof U-value

0.12

W/m²K

Photovoltaic array

2.10

kW

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)



Property Reference	210928	Issued on Date	20/10/2021
Assessment Reference	APARTMENT 3.04	Prop Type Ref	APARTMENT 3.04
Property	UB7 7QR		
SAP Rating	97 A	DER	17.43
Environmental	89 B	TER	28.29
CO ₂ Emissions (t/year)	0.62	% DER<TER	38.40
General Requirements Compliance	Fail	DFEE	51.63
		TFEE	54.21
		% DFEE<TFEE	4.76
Assessor Details	Mr. Dion Mellows, SHA Environmental Limited, Tel: 02036370427, info@shaenvironmental.co.uk		Assessor ID
			G297-0001
Client			

SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

Orientation	South East
Property Tenure	Unknown
Transaction Type	None of the above
Terrain Type	Urban
1.0 Property Type	House, Semi-Detached
2.0 Number of Storeys	1
3.0 Date Built	2021
4.0 Sheltered Sides	3
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements			
	Ground Floor:	Heat Loss Perimeter 19.88 m	Internal Floor Area 64.74 m ²
			Average Storey Height 2.62 m
7.0 Living Area	24.16	m ²	
8.0 Thermal Mass Parameter	Precise calculation		
Thermal Mass	188.55	kJ/m ² K	

9.0 External Walls						
Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
External Wall	Cavity Wall	Cavity wall; dense plaster, lightweight aggregate block, filled cavity, any outside structure	0.18	140.00	17.71	15.23
Dormer Cheek	Steel Frame	Steel frame wall (warm frame or hybrid construction)	0.18	14.00	4.81	4.81
Dormer Frontal Face	Steel Frame	Steel frame wall (warm frame or hybrid construction)	0.18	14.00	35.58	18.43

9.1 Party Walls						
Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)	
Wall to Dwelling	Filled Cavity with Edge Sealing	Single plasterboard on dabs on both sides, dense blocks, cavity or cavity fill	0.00	70.00	50.28	

9.2 Internal Walls						
Description	Construction			Kappa (kJ/m ² K)	Area (m ²)	
Internal Wall	Plasterboard on timber frame			9.00	48.16	

10.0 External Roofs

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)



Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area (m²)	Nett Area (m²)
Flat HLR	External Flat Roof	Plasterboard, insulated flat roof	0.12	9.00	44.95	44.95
Dormer Flat Roof	External Flat Roof	Plasterboard, insulated flat roof	0.12	9.00	23.60	23.60

11.1 Party Floors

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor	Concrete floor slab, carpeted	80.00	64.74

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Window	BFRC data	Window	Double glazed			0.76			1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
NW1	Window	[1] External Wall	North West	Dark- coloured curtain or roller blind	0.00					2.48	50
NW2	Window	[3] Dormer Frontal Face	North West	Dark- coloured curtain or roller blind	0.00					6.00	50
NW3	Window	[3] Dormer Frontal Face	North West	Dark- coloured curtain or roller blind	0.00					2.15	50
NW4	Window	[3] Dormer Frontal Face	North West	Dark- coloured curtain or roller blind	0.00					4.50	50
NW5	Window	[3] Dormer Frontal Face	North West	Dark- coloured curtain or roller blind	0.00					4.50	50

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	
17.0 Thermal Bridging	Default	
Y-value	0.150	W/m²K
18.0 Pressure Testing	Yes	
Designed AP ₅₀	5.00	m³/(h.m²) @ 50 Pa
Property Tested ?		
As Built AP ₅₀		m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather	Windows fully open
Cross ventilation possible	No
Night Ventilation	No
Air change rate	4.00

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)



Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500029
Configuration	2
MVHR Duct Insulated	Yes
Manufacturer SFP	1.13
Duct Type	Rigid
MVHR Efficiency	89.00
Wet Rooms	2

20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				0
Number of passive vents				0
Number of flueless gas fires				0

21.0 Fixed Cooling System

No

22.0 Lighting

Internal

Total number of light fittings	25	
Total number of L.E.L. fittings	25	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted	No
------------------------	----

23.0 Electricity Tariff

24 Hour

24.0 Main Heating 1

Description	SAP table	
Percentage of Heat	Underfloor Electric Heating	
Main Heating	100	%
SAP Code	SEH	
Efficiency (SAP Table)	424	
Controls	100.0	%
Sap Code	CMD Time and temperature zone control	
	2706	

25.0 Main Heating 2

None

Community Heating	None
-------------------	------

28.0 Water Heating

Water Heating	HES Instantaneous at point of use
Flue Gas Heat Recovery System	Independent
Waste Water Heat Recovery	No
Instantaneous System 1	No

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)



Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
SAP Code	909

29.0 Hot Water Cylinder

32.0 Photovoltaic Unit

PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
2.10	South	30°	None Or Little	Yes

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

	Typical Cost	Typical savings per year	Ratings after improvement	
			SAP rating	Environmental Impact
Solar water heating	£4,000 - £6,000	£78	A 99	

BLOCK COMPLIANCE

Calculation Type: New Build (As Designed)



Block Reference	000122	Issued on Date	20/10/2021
Block Name	Proposed Case		
Assessor Details	Mr. Dion Mellows, SHA Environmental Limited, Tel: 02036370427, info@shaenvironmental.co.uk		Assessor ID
			G297-0001
Client			

Block Compliance Report - DER

Block Reference: 000122		Block Name: Proposed Case			
Property-Assessment Reference	Multiplier	Floor Area (m ²)	DER (kgCO ₂ /m ²)	TER (kgCO ₂ /m ²)	% DER/TER
210925-APARTMENT 3.01	1	64.74	16.03	25.05	36.01 %
210926-APARTMENT 3.02	1	64.74	16.03	25.05	36.01 %
210927-APARTMENT 3.03	1	64.74	17.43	28.29	38.40 %
210928-APARTMENT 3.04	1	64.74	17.43	28.29	38.40 %
Totals:	4	258.96	66.92	106.69	
Average DER = 16.73 kgCO ₂ /m ²		% DER/TER	PASS		
Average TER = 26.67 kgCO ₂ /m ²		37.27 %			

Block Compliance Report - DFEE

Block Reference: 000122		Block Name: Proposed Case			
Property-Assessment Reference	Multiplier	Floor Area (m ²)	DFEE (kWh/m ² /yr)	TFEE (kWh/m ² /yr)	% DFEE/TFEE
210925-APARTMENT 3.01	1	64.74	38.41	43.48	11.66 %
210926-APARTMENT 3.02	1	64.74	38.41	43.48	11.66 %
210927-APARTMENT 3.03	1	64.74	51.63	54.21	4.76 %
210928-APARTMENT 3.04	1	64.74	51.63	54.21	4.76 %
Totals:	4	258.96	180.08	195.39	
Average DFEE = 45.02 kWh/m ² /yr		% DFEE/TFEE	PASS		
Average TFEE = 48.85 kWh/m ² /yr		7.84 %			

DWELLING SIGN OFF REPORT



Section 1: Dwelling Information

Dwelling Address (Please confirm final postal address and post code of the dwelling.)

House Name		
House Number		
Postcode	UB7 7QR	
Street		
Locality		
Town		
County		

Dwelling Orientation South East (Please confirm orientation of main entrance door of the dwelling.)

Comments

Terrain Type Urban

Property Type House, Semi-Detached

Comments

Overshading (called Sunlight/shade in assessment) Average or unknown

Comments

Section 2: Dwelling Construction Details

Thermal Mass Parameter Precise calculation

Thermal Mass 188.55 kJ/m²K

Comments

External Walls

Type	Cavity Wall		
Construction	Cavity wall; dense plaster, lightweight aggregate block, filled cavity, any outside structure		
U-value	0.18	W/m ² K	U-value calculations should be provided to verify the u-value entered in the survey.
Gross Area	17.71	m ²	
Type	Steel Frame		
Construction	Steel frame wall (warm frame or hybrid construction)		
U-value	0.18	W/m ² K	U-value calculations should be provided to verify the u-value entered in the survey.
Gross Area	4.81	m ²	
Type	Steel Frame		
Construction	Steel frame wall (warm frame or hybrid construction)		
U-value	0.18	W/m ² K	U-value calculations should be provided to verify the u-value entered in the survey.
Gross Area	35.58	m ²	

Comments

Party Walls

DWELLING SIGN OFF REPORT



Type	Construction	U-Value (W/m²K)	Area (m²)
Filled Cavity with Edge Sealing	Single plasterboard on dabs on both sides, dense blocks, cavity or cavity fill	0.00	50.28
Comments			

External Roofs

Type	External Flat Roof		
Construction	Plasterboard, insulated flat roof		
U-value	0.12	W/m²K	U-value calculations should be provided to verify the u-value entered in the survey.
Gross Area	44.95	m²	
Type	External Flat Roof		
Construction	Plasterboard, insulated flat roof		
U-value	0.12	W/m²K	U-value calculations should be provided to verify the u-value entered in the survey.
Gross Area	23.60	m²	

Comments

Opening Types

Description	Type	Glazing	Frame Type	U Value (W/m²K)
Window	Window	Double glazed		1.20
Comments				

Openings

Name	Opening Type	Location	Orientation	Area (m²)
NW1	Window	[1] External Wall	North West	2.48
NW2	Window	[3] Dormer Frontal Face	North West	6.00
NW3	Window	[3] Dormer Frontal Face	North West	2.15
NW4	Window	[3] Dormer Frontal Face	North West	4.50
NW5	Window	[3] Dormer Frontal Face	North West	4.50

Comments

Thermal Bridging

	Default	
Y-value	0.150	W/m²K
Comments		

DWELLING SIGN OFF REPORT



Where specific construction details have been used documentary evidence should be provided to the SAP assessor, usually in the form of signed checklists.

Pressure Testing

Yes

As Built AP₅₀

m³/(h.m²) @ 50 Pa

Where an air pressure test has been carried out a copy of the test certificate should be forwarded to the SAP assessor.

Comments

Section 3: Dwelling Systems

Mechanical Ventilation

Type Balanced mechanical ventilation with heat recovery

Brand Model Nuaire MRXBOX90L

SFP 1.13

Efficiency 89.00

Duct Type Rigid

Duct Brand Model

Number of Wet Rooms

2

Comments

Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				0
Number of passive vents				0
Number of flueless gas fires				0

Comments

Internal Lighting

Total number of light fittings 25

Total number of L.E.L. fittings 25

Percentage of L.E.L. fittings 100.00 %

Comments

External Lighting

External lights fitted No

Comments

DWELLING SIGN OFF REPORT



Electricity Tariff	24 Hour
Comments	

Main Heating 1	SAP table
Fuel Type	electricity
Main Heating	Electricity SEH Underfloor heating in thin screed (standard tariff)
Efficiency (SAP Table)	100.0 %
Brand, Model	
Flue Type	
Fan Assisted Flue	
Heat Emitter	
Flow Temperature	
Comments	

Heating Controls

Description	CMD Time and temperature zone control
Boiler Interlock	
Delayed Start Stat	
Compensator	
Comments	

Main Heating 2	None
Comments	

Water Heating System	HES Instantaneous at point of use
Water Heating	Independent
Supplementary Immersion	
Comments	

Section 4: Dwelling Renewable Energy

Photovoltaic Panels	One Dwelling			
PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
2.10	South	30°	None Or Little	Yes
MCS Certificate available?				

DWELLING SIGN OFF REPORT



Comments

Section 5: Declaration

I confirm that all details provided above are accurate to the best of my knowledge.

Signed

Date



SAP Report Submission for Building Regulations Compliance

Client:

Project:

UB7 7QR

Contact: Dion Mellows
SHA Environmental Limited
info@shaenvironmental.co.uk

Report Issue Date: 20/10/2021

EXCELLENCE
IN ENERGY
ASSESSMENT

PREDICTED ENERGY ASSESSMENT



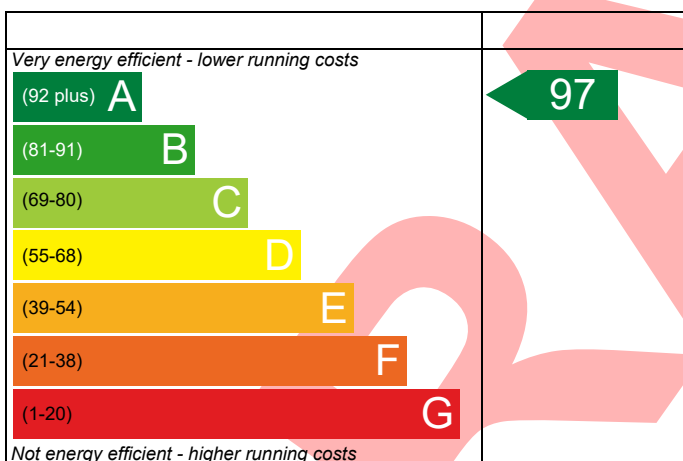
UB7 7QR

Dwelling type: House, Semi-Detached
 Date of assessment: 20/10/2021
 Produced by: SHA Environmental Limited
 Total floor area: 64.74 m²

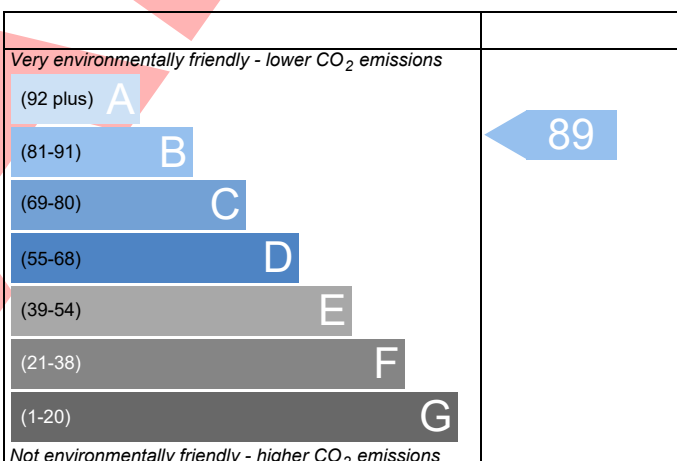
This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP2012 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.

Energy Efficiency Rating



Environmental Impact (CO₂) Rating



England EU Directive 2002/91/EC

The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

England EU Directive 2002/91/EC

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO₂) emissions. The higher the rating the less impact it has on the environment.

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Designed)



Property Reference	210927	Issued on Date	20/10/2021
Assessment Reference	APARTMENT 3.03	Prop Type Ref	APARTMENT 3.03
Property	UB7 7QR		
SAP Rating	97 A	DER	17.43
Environmental	89 B	TER	28.29
CO ₂ Emissions (t/year)	0.62	% DER<TER	38.40
General Requirements Compliance	Fail	DFEE	51.63
		TFEE	54.21
		% DFEE<TFEE	4.76
Assessor Details	Mr. Dion Mellows, SHA Environmental Limited, Tel: 02036370427, info@shaenvironmental.co.uk		Assessor ID
			G297-0001
Client			

SUMMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Electricity		
Fuel factor	1.55 (electricity)		
Target Carbon Dioxide Emission Rate (TER)	28.29	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	17.43	kgCO ₂ /m ²	Pass
	-10.86 (-38.4%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	54.21	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	51.63	kWh/m ² /yr	
	-2.6 (-4.8%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Roof	0.12 (max. 0.20)	0.12 (max. 0.35)	Pass
Openings	1.20 (max. 2.00)	1.20 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated using default γ -value of 0.15

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)	m ³ /(h.m ²) @ 50 Pa	
Maximum	10.0	m ³ /(h.m ²) @ 50 Pa	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system	Electric underfloor heating - Electric Underfloor heating in thin screed (standard tariff)	
---------------------	---	--

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Designed)



Secondary heating system

None

5 Cylinder insulation

Hot water storage

No cylinder

6 Controls

Space heating controls

Time and temperature zone control

Pass

Hot water controls

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100

%

Minimum

75

%

Pass

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power

1.13

Maximum

1.5

Pass

MVHR efficiency

89

%

Minimum

70

%

Pass

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)

High

Fail

Based on:

Overshading

Average

Windows facing North West

19.63 m², No overhang

Air change rate

4.00 ach

Blinds/curtains

Dark-coloured curtain or roller blind, closed 50% of daylight hours

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

5.00 (design value)

m³/(h.m²) @ 50 Pa

Maximum

10.0

m³/(h.m²) @ 50 Pa

Pass

10 Key features

Party wall U-value

0.00

W/m²K

Roof U-value

0.12

W/m²K

Roof U-value

0.12

W/m²K

Photovoltaic array

2.10

kW

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

RECOMMENDATIONS

	Typical cost	Typical savings per year	Energy efficiency	Environmental impact	Result
Low energy lights			0	0	Already installed
Solar water heating	£4,000 - £6,000	£78	A 99	A 93	Recommended
Photovoltaic			0	0	Already installed
Wind turbine			0	0	Not applicable
Totals	£4,000 - £6,000	£78	A 99	A 93	

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	210927	Issued on Date	20/10/2021
Assessment Reference	APARTMENT 3.03	Prop Type Ref	APARTMENT 3.03
Property	UB7 7QR		

SAP Rating	97 A	DER	17.43	TER	28.29
Environmental	89 B	% DER<TER	38.40		
CO ₂ Emissions (t/year)	0.62	DFEE	51.63	TFEE	54.21
General Requirements Compliance	Fail	% DFEE<TFEE	4.76		

Assessor Details	Mr. Dion Mellows, SHA Environmental Limited, Tel: 02036370427, info@shaenvironmental.co.uk	Assessor ID	G297-0001
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Client	
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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	64.7400 (1b)	x 2.6200 (2b)	= 169.6188 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 169.6188 (5)

2. Ventilation rate

													main	secondary	other		total	m3 per hour			
													heating		heating			=			
Number of chimneys													0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues													0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans																			0 * 10 =	0.0000	(7a)
Number of passive vents																			0 * 10 =	0.0000	(7b)
Number of flueless gas fires																			0 * 40 =	0.0000	(7c)
													Air changes per hour								
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =													0.0000 / (5) = 0.0000 (8)								
Pressure test													Yes								
Measured/design AP50													5.0000								
Infiltration rate													0.2500 (18)								
Number of sides sheltered													3 (19)								
Shelter factor													(20) = 1 - [0.075 x (19)] = 0.7750 (20)								
Infiltration rate adjusted to include shelter factor													(21) = (18) x (20) = 0.1938 (21)								
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec									
Wind speed	4.2000	4.0000	4.0000	3.7000	3.8000	3.5000	3.6000	3.4000	3.4000	3.7000	3.5000	4.0000	(22)								
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9500	0.8750	0.9000	0.8500	0.8500	0.9250	0.8750	1.0000	(22a)								
Adj infilt rate	0.2034	0.1938	0.1938	0.1792	0.1841	0.1695	0.1744	0.1647	0.1647	0.1792	0.1695	0.1938	(22b)								
Balanced mechanical ventilation with heat recovery																					
If mechanical ventilation:													0.5000 (23a)								
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													75.6500 (23c)								
Effective ac	0.3252	0.3155	0.3155	0.3010	0.3058	0.2913	0.2961	0.2864	0.2864	0.3010	0.2913	0.3155	(25)								

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Window (Uw = 1.20)			19.6300	1.1450	22.4771		(27)
External Wall	17.7100	2.4800	15.2300	0.1800	2.7414	140.0000	2132.2000 (29a)
Dormer Cheek	4.8100		4.8100	0.1800	0.8658	14.0000	67.3400 (29a)
Dormer Frontal Face	35.5800	17.1500	18.4300	0.1800	3.3174	14.0000	258.0200 (29a)
Flat HLR	44.9500		44.9500	0.1200	5.3940	9.0000	404.5500 (30)
Dormer Flat Roof	23.6000		23.6000	0.1200	2.8320	9.0000	212.4000 (30)
Total net area of external elements Aum(A, m ²)			126.6500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		37.6277		(33)
Wall to Dwelling			50.2800	0.0000	0.0000	70.0000	3519.6000 (32)
Party Floor			64.7400			80.0000	5179.2000 (32d)
Internal Wall			48.1600			9.0000	433.4400 (32c)
Heat capacity Cm = Sum (A x k)							(28)...(30) + (32) + (32a)...(32e) = 12206.7500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							188.5504 (35)
Thermal bridges (Default value 0.150 * total exposed area)							18.9975 (36)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF HEAT DEMAND 09 Jan 2014

Total fabric heat loss (33) + (36) = 56.6252 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	18.2021	17.6599	17.6599	16.8465	17.1176	16.3042	16.5754	16.0331	16.0331	16.8465	16.3042	17.6599	(38)
Heat transfer coeff	74.8273	74.2851	74.2851	73.4717	73.7428	72.9294	73.2006	72.6583	72.6583	73.4717	72.9294	74.2851	(39)
Average = Sum(39)m / 12 =												73.5621	(39)
HLP	1.1558	1.1474	1.1474	1.1349	1.1391	1.1265	1.1307	1.1223	1.1223	1.1349	1.1265	1.1474	(40)
HLP (average)												1.1363	(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													2.1120 (42)
Average daily hot water use (litres/day)													84.3601 (43)
Daily hot water use	92.7961	89.4217	86.0473	82.6729	79.2985	75.9241	75.9241	79.2985	82.6729	86.0473	89.4217	92.7961	(44)
Energy content (annual)	137.6139	120.3580	124.1987	108.2794	103.8967	89.6549	83.0785	95.3338	96.4724	112.4292	122.7253	133.2717	(45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
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	116.9718	102.3043	105.5689	92.0375	88.3122	76.2067	70.6167	81.0337	82.0015	95.5649	104.3165	113.2810	(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	116.9718	102.3043	105.5689	92.0375	88.3122	76.2067	70.6167	81.0337	82.0015	95.5649	104.3165	113.2810	(64)
RHI water heating demand													
Heat gains from water heating, kWh/month	29.2430	25.5761	26.3922	23.0094	22.0780	19.0517	17.6542	20.2584	20.5004	23.8912	26.0791	28.3202	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	41.1707	36.5674	29.7386	22.5141	16.8295	14.2082	15.3525	19.9557	26.7845	34.0091	39.6936	42.3150	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	275.7075	278.5685	271.3589	256.0105	236.6360	218.4267	206.2617	203.4008	210.6103	225.9587	245.3332	263.5425	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	(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)	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	(71)
Water heating gains (Table 5)	39.3051	38.0596	35.4734	31.9575	29.6748	26.4607	23.7287	27.2291	28.4727	32.1118	36.2210	38.0648	(72)
Total internal gains	448.2073	445.2196	428.5950	402.5062	375.1644	351.1196	337.3670	342.6096	357.8917	384.1037	413.2719	435.9464	(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		
Northwest	19.6300				13.3498		0.7600		0.0000		0.7700		153.3553 (81)
Solar gains	153.3553	273.3590	498.4206	841.5357	1088.4670	1237.7398	1147.2730	934.8519	650.3299	367.2180	186.7385	119.7986	(83)
Total gains	601.5626	718.5786	927.0156	1244.0418	1463.6314	1588.8595	1484.6400	1277.4616	1008.2216	751.3217	600.0104	555.7451	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	45.3145	45.6453	45.6453	46.1506	45.9809	46.4938	46.3216	46.6673	46.6673	46.1506	46.4938	45.6453	
alpha	4.0210	4.0430	4.0430	4.0767	4.0654	4.0996	4.0881	4.1112	4.1112	4.0767	4.0996	4.0430	
util living area	0.9664	0.9361	0.8292	0.5967	0.3829	0.2109	0.1282	0.1592	0.3910	0.7536	0.9363	0.9738	(86)
MIT	20.1223	20.3062	20.6267	20.8643	20.9233	20.9334	20.9338	20.9341	20.9268	20.7949	20.4194	20.0784	(87)
Th 2	19.9555	19.9623	19.9623	19.9725	19.9691	19.9793	19.9759	19.9827	19.9827	19.9725	19.9793	19.9623	(88)
util rest of house	0.9584	0.9220	0.7979	0.5495	0.3334	0.1642	0.0777	0.1014	0.3209	0.6987	0.9194	0.9673	(89)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF HEAT DEMAND 09 Jan 2014

MIT 2	18.8149	19.0788	19.5107	19.8070	19.8639	19.8823	19.8789	19.8862	19.8820	19.7400	19.2569	18.7580 (90)
Living area fraction									fLA = Living area / (4) =			0.3732 (91)
MIT	19.3028	19.5368	19.9272	20.2015	20.2592	20.2746	20.2726	20.2773	20.2719	20.1337	19.6907	19.2507 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3028	19.5368	19.9272	20.2015	20.2592	20.2746	20.2726	20.2773	20.2719	20.1337	19.6907	19.2507 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9523	0.9153	0.7968	0.5603	0.3474	0.1777	0.0923	0.1181	0.3411	0.7080	0.9138	0.9618 (94)	
Useful gains	572.8630	657.7120	738.6125	697.0555	508.4679	282.3734	137.0651	150.9098	343.8819	531.9183	548.2871	534.5367 (95)	
Ext temp.	5.2000	5.7000	7.6000	10.2000	13.3000	16.4000	18.4000	18.2000	15.5000	11.9000	8.1000	5.2000 (96)	
Heat loss rate W													
	1055.2755	1027.8704	915.7253	734.8298	513.1946	282.5691	137.0724	150.9303	346.7196	604.9417	845.3044	1043.7601 (97)	
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)	
Space heating kWh													
	358.9149	248.7464	131.7720	27.1975	3.5167	0.0000	0.0000	0.0000	0.0000	54.3294	213.8525	378.8622 (98)	
Space heating													
RHI space heating demand												1417.1916 (98)	
												1417 (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	64.7400 (1b)	x 2.6200 (2b)	= 169.6188 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 169.6188 (5)

2. Ventilation rate

	main		secondary		other		total	m3 per hour				
	heating		heating									
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)			
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)			
Number of intermittent fans							0 * 10 =	0.0000	(7a)			
Number of passive vents							0 * 10 =	0.0000	(7b)			
Number of flueless gas fires							0 * 40 =	0.0000	(7c)			
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000	(8)			
Pressure test								Yes				
Measured/design AP50								5.0000				
Infiltration rate								0.2500	(18)			
Number of sides sheltered								3	(19)			
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.7750	(20)			
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1938	(21)			
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750
	0.2470	0.2422	0.2373	0.2131	0.2083	0.1841	0.1841	0.1792	0.1938	0.2083	0.2180	0.2277
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.5000 (23a)											
	75.6500 (23c)											
Effective ac	0.3688	0.3639	0.3591	0.3349	0.3300	0.3058	0.3058	0.3010	0.3155	0.3300	0.3397	0.3494
	(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	
Window (Uw = 1.20)			19.6300	1.1450	22.4771			(27)
External Wall	17.7100	2.4800	15.2300	0.1800	2.7414	140.0000	2132.2000	(29a)
Dormer Cheek	4.8100		4.8100	0.1800	0.8658	14.0000	67.3400	(29a)
Dormer Frontal Face	35.5800	17.1500	18.4300	0.1800	3.3174	14.0000	258.0200	(29a)
Flat HLR	44.9500		44.9500	0.1200	5.3940	9.0000	404.5500	(30)
Dormer Flat Roof	23.6000		23.6000	0.1200	2.8320	9.0000	212.4000	(30)
Total net area of external elements Aum(A, m2)			126.6500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		37.6277			(33)
Wall to Dwelling			50.2800	0.0000	0.0000	70.0000	3519.6000	(32)
Party Floor			64.7400			80.0000	5179.2000	(32d)
Internal Wall			48.1600			9.0000	433.4400	(32c)
Heat capacity Cm = Sum(A x k)					(28) ... (30) + (32) + (32a) ... (32e) =		12206.7500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							188.5504	(35)
Thermal bridges (Default value 0.150 * total exposed area)							18.9975	(36)
Total fabric heat loss						(33) + (36) =	56.6252	(37)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1120 (42)
Average daily hot water use (litres/day)												84.3601 (43)
Daily hot water use	Jan 92.7961	Feb 89.4217	Mar 86.0473	Apr 82.6729	May 79.2985	Jun 75.9241	Jul 75.9241	Aug 79.2985	Sep 82.6729	Oct 86.0473	Nov 89.4217	Dec 92.7961 (44)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

Energy content (annual)	137.6139	120.3580	124.1987	108.2794	103.8967	89.6549	83.0785	95.3338	96.4724	112.4292	122.7253	133.2717 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1327.3126 (45)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
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												
Solar input	116.9718	102.3043	105.5689	92.0375	88.3122	76.2067	70.6167	81.0337	82.0015	95.5649	104.3165	113.2810 (62)
Solar input (sum of months) = Sum(63)m =	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	116.9718	102.3043	105.5689	92.0375	88.3122	76.2067	70.6167	81.0337	82.0015	95.5649	104.3165	113.2810 (64)
Heat gains from water heating, kWh/month	29.2430	25.5761	26.3922	23.0094	22.0780	19.0517	17.6542	20.2584	20.5004	23.8912	26.0791	28.3202 (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	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	41.1707	36.5674	29.7386	22.5141	16.8295	14.2082	15.3525	19.9557	26.7845	34.0091	39.6936	42.3150 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	275.7075	278.5685	271.3589	256.0105	236.6360	218.4267	206.2617	203.4008	210.6103	225.9587	245.3332	263.5425 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840 (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)	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801 (71)
Water heating gains (Table 5)	39.3051	38.0596	35.4734	31.9575	29.6748	26.4607	23.7287	27.2291	28.4727	32.1118	36.2210	38.0648 (72)
Total internal gains	448.2073	445.2196	428.5950	402.5062	375.1644	351.1196	337.3670	342.6096	357.8917	384.1037	413.2719	435.9464 (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
Northwest					19.6300	11.2829	0.7600	0.0000			0.7700			129.6125 (81)
Solar gains	129.6125	263.8300	475.3378	780.6412	1049.3350	1118.7021	1046.5229	834.3002	579.2065	322.4212	163.0861			105.8481 (83)
Total gains	577.8198	709.0497	903.9328	1183.1474	1424.4994	1469.8218	1383.8899	1176.9098	937.0982	706.5249	576.3580			541.7945 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	43.8835	44.0380	44.1936	44.9885	45.1509	45.9809	45.9809	46.1506	45.6453	45.1509	44.8272	44.5082
alpha	3.9256	3.9359	3.9462	3.9992	4.0101	4.0654	4.0654	4.0767	4.0430	4.0101	3.9885	3.9672
util living area	0.9760	0.9493	0.8713	0.6851	0.4755	0.3189	0.2340	0.2859	0.5243	0.8384	0.9568	0.9807 (86)
MIT	19.9597	20.1730	20.4961	20.7959	20.9042	20.9292	20.9325	20.9316	20.9044	20.6783	20.2598	19.9271 (87)
Th 2	19.9252	19.9286	19.9319	19.9488	19.9521	19.9691	19.9691	19.9725	19.9623	19.9521	19.9454	19.9386 (88)
util rest of house	0.9703	0.9382	0.8465	0.6420	0.4262	0.2684	0.1794	0.2226	0.4532	0.7980	0.9453	0.9761 (89)
MIT 2	18.5578	18.8635	19.3108	19.7054	19.8284	19.8688	19.8712	19.8744	19.8430	19.5800	19.0054	18.5212 (90)
Living area fraction									fLA = Living area / (4) =			0.3732 (91)
MIT	19.0810	19.3522	19.7531	20.1124	20.2299	20.2645	20.2673	20.2689	20.2391	19.9899	19.4735	19.0459 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0810	19.3522	19.7531	20.1124	20.2299	20.2645	20.2673	20.2689	20.2391	19.9899	19.4735	19.0459 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	557.4310	660.1068	761.0014	767.8480	626.0154	415.9176	270.1499	283.5965	442.9660	564.9582	541.2061	526.1640 (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	1142.0865	1112.7642	1016.8494	845.0704	640.5812	417.7172	270.4352	284.2549	456.0424	705.1644	935.9414	1131.0025 (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	434.9837	304.1858	190.3510	55.6002	10.8369	0.0000	0.0000	0.0000	0.0000	104.3134	284.2094	449.9998 (98)
Space heating												1834.4802 (98)
Space heating per m2										(98) / (4) =		28.3361 (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)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1834.4802 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	434.9837	304.1858	190.3510	55.6002	10.8369	0.0000	0.0000	0.0000	0.0000	104.3134	284.2094	449.9998	(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)	434.9837	304.1858	190.3510	55.6002	10.8369	0.0000	0.0000	0.0000	0.0000	104.3134	284.2094	449.9998	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	116.9718	102.3043	105.5689	92.0375	88.3122	76.2067	70.6167	81.0337	82.0015	95.5649	104.3165	113.2810	(64)
Efficiency of water heater (217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(216)
Fuel for water heating, kWh/month	116.9718	102.3043	105.5689	92.0375	88.3122	76.2067	70.6167	81.0337	82.0015	95.5649	104.3165	113.2810	(219)
Water heating fuel used												1128.2157	(219)
Annual totals kWh/year													
Space heating fuel - main system												1834.4802	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 1.4125)													
mechanical ventilation fans (SFP = 1.4125)													292.2956 (230a)
Total electricity for the above, kWh/year													292.2956 (231)
Electricity for lighting (calculated in Appendix L)													290.8350 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 2.10 * 1080 * 1.00) =										-1813.6014		-1813.6014	(233)
Total delivered energy for all uses												1732.2252	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1834.4802	6.6100	121.2591 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1128.2157	6.6100	74.5751 (247)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Energy for lighting	290.8350	13.1900	38.3611 (250)
Additional standing charges			70.0000 (251)
Energy saving/generation technologies			
PV Unit	-1813.6014	13.1900	-239.2140 (252)
Total energy cost			64.9813 (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] =	0.2487 (257)
SAP value		96.5307
SAP rating (Section 12)		97 (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	1834.4802	0.5190	952.0952 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1128.2157	0.5190	585.5440 (264)
Space and water heating			1537.6392 (265)
Pumps and fans	292.2956	0.5190	151.7014 (267)
Energy for lighting	290.8350	0.5190	150.9433 (268)
Energy saving/generation technologies			
PV Unit	-1813.6014	0.5190	-941.2591 (269)
Total kg/year			899.0249 (272)
CO2 emissions per m2			13.8900 (273)
EI value			89.0223
EI rating			89 (274)
EI band			B

Calculation of stars for heating and DHW

FULL SAP CALCULATION PRINTOUT

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CALCULATION OF ENERGY RATINGS 09 Jan 2014

Main heating energy efficiency	$6.61 \times (1 + 0.29 \times 0.25) / 1.0000 = 7.089$, stars = 3
Main heating environmental impact	$0.519 \times (1 + 0.29 \times 0.25) / 1.0000 = 0.5566$, stars = 1
Water heating energy efficiency	$6.61 / 1.0000 = 6.610$, stars = 3
Water heating environmental impact	$0.519 / 1.0000 = 0.5190$, stars = 2

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	64.7400 (1b)	x 2.6200 (2b)	= 169.6188 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 169.6188 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					0.0000 / (5) = 0.0000 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.2500 (18)
					3 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.1938 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.8000	3.5000	3.6000	3.4000	3.4000	3.7000	3.5000	4.0000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9500	0.8750	0.9000	0.8500	0.8500	0.9250	0.8750	1.0000 (22a)
Adj infilt rate	0.2034	0.1938	0.1938	0.1792	0.1841	0.1695	0.1744	0.1647	0.1647	0.1792	0.1695	0.1938 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												75.6500 (23c)
Effective ac	0.3252	0.3155	0.3155	0.3010	0.3058	0.2913	0.2961	0.2864	0.2864	0.3010	0.2913	0.3155 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Window (Uw = 1.20)			19.6300	1.1450	22.4771		(27)
External Wall	17.7100	2.4800	15.2300	0.1800	2.7414	140.0000	2132.2000 (29a)
Dormer Cheek	4.8100		4.8100	0.1800	0.8658	14.0000	67.3400 (29a)
Dormer Frontal Face	35.5800	17.1500	18.4300	0.1800	3.3174	14.0000	258.0200 (29a)
Flat HLR	44.9500		44.9500	0.1200	5.3940	9.0000	404.5500 (30)
Dormer Flat Roof	23.6000		23.6000	0.1200	2.8320	9.0000	212.4000 (30)
Total net area of external elements Aum(A, m ²)			126.6500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	37.6277		(33)
Wall to Dwelling			50.2800	0.0000	0.0000	70.0000	3519.6000 (32)
Party Floor			64.7400			80.0000	5179.2000 (32d)
Internal Wall			48.1600			9.0000	433.4400 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 12206.7500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							188.5504 (35)
Thermal bridges (Default value 0.150 * total exposed area)							18.9975 (36)
Total fabric heat loss							(33) + (36) = 56.6252 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	18.2021	17.6599	17.6599	16.8465	17.1176	16.3042	16.5754	16.0331	16.0331	16.8465	16.3042	17.6599 (38)
Heat transfer coeff	74.8273	74.2851	74.2851	73.4717	73.7428	72.9294	73.2006	72.6583	72.6583	73.4717	72.9294	74.2851 (39)
Average = Sum(39)m / 12 =												73.5621 (39)
HLP	1.1558	1.1474	1.1474	1.1349	1.1391	1.1265	1.1307	1.1223	1.1223	1.1349	1.1265	1.1474 (40)
HLP (average)												1.1363 (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												2.1120 (42)
Average daily hot water use (litres/day)												84.3601 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	92.7961	89.4217	86.0473	82.6729	79.2985	75.9241	75.9241	79.2985	82.6729	86.0473	89.4217	92.7961 (44)



FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

Energy conte	137.6139	120.3580	124.1987	108.2794	103.8967	89.6549	83.0785	95.3338	96.4724	112.4292	122.7253	133.2717 (45)
Energy content (annual)										Total = Sum (45)m =		1327.3126 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
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												
Solar input	116.9718	102.3043	105.5689	92.0375	88.3122	76.2067	70.6167	81.0337	82.0015	95.5649	104.3165	113.2810 (62)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum (63)m =												0.0000 (63)
Output from w/h	116.9718	102.3043	105.5689	92.0375	88.3122	76.2067	70.6167	81.0337	82.0015	95.5649	104.3165	113.2810 (64)
												Total per year (kWh/year) = Sum (64)m = 1128.2157 (64)
Heat gains from water heating, kWh/month	29.2430	25.5761	26.3922	23.0094	22.0780	19.0517	17.6542	20.2584	20.5004	23.8912	26.0791	28.3202 (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	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	41.1707	36.5674	29.7386	22.5141	16.8295	14.2082	15.3525	19.9557	26.7845	34.0091	39.6936	42.3150 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	275.7075	278.5685	271.3589	256.0105	236.6360	218.4267	206.2617	203.4008	210.6103	225.9587	245.3332	263.5425 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840 (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)	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801 (71)
Water heating gains (Table 5)	39.3051	38.0596	35.4734	31.9575	29.6748	26.4607	23.7287	27.2291	28.4727	32.1118	36.2210	38.0648 (72)
Total internal gains	448.2073	445.2196	428.5950	402.5062	375.1644	351.1196	337.3670	342.6096	357.8917	384.1037	413.2719	435.9464 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W				
-----				-----		-----		-----		-----		-----			
Northwest				19.6300		13.3498		0.7600		0.0000		0.7700		153.3553 (81)	
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Solar gains	153.3553	273.3590	498.4206	841.5357	1088.4670	1237.7398	1147.2730	934.8519	650.3299	367.2180	186.7385	119.7986	(83)		
Total gains	601.5626	718.5786	927.0156	1244.0418	1463.6314	1588.8595	1484.6400	1277.4616	1008.2216	751.3217	600.0104	555.7451	(84)		

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	45.3145	45.6453	45.6453	46.1506	45.9809	46.4938	46.3216	46.6673	46.6673	46.1506	46.4938	45.6453
alpha	4.0210	4.0430	4.0430	4.0767	4.0654	4.0996	4.0881	4.1112	4.1112	4.0767	4.0996	4.0430
util living area	0.9664	0.9361	0.8292	0.5967	0.3829	0.2109	0.1282	0.1592	0.3910	0.7536	0.9363	0.9738 (86)
MIT	20.1223	20.3062	20.6267	20.8643	20.9233	20.9334	20.9338	20.9341	20.9268	20.7949	20.4194	20.0784 (87)
Th 2	19.9555	19.9623	19.9623	19.9725	19.9691	19.9793	19.9759	19.9827	19.9827	19.9725	19.9793	19.9623 (88)
util rest of house	0.9584	0.9220	0.7979	0.5495	0.3334	0.1642	0.0777	0.1014	0.3209	0.6987	0.9194	0.9673 (89)
MIT 2	18.8149	19.0788	19.5107	19.8070	19.8639	19.8823	19.8789	19.8862	19.8820	19.7400	19.2569	18.7580 (90)
Living area fraction									fLA = Living area / (4) =			0.3732 (91)
MIT	19.3028	19.5368	19.9272	20.2015	20.2592	20.2746	20.2726	20.2773	20.2719	20.1337	19.6907	19.2507 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3028	19.5368	19.9272	20.2015	20.2592	20.2746	20.2726	20.2773	20.2719	20.1337	19.6907	19.2507 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9523	0.9153	0.7968	0.5603	0.3474	0.1777	0.0923	0.1181	0.3411	0.7080	0.9138	0.9618 (94)
Useful gains	572.8630	657.7120	738.6125	697.0555	508.4679	282.3734	137.0651	150.9098	343.8819	531.9183	548.2871	534.5367 (95)
Ext temp.	5.2000	5.7000	7.6000	10.2000	13.3000	16.4000	18.4000	18.2000	15.5000	11.9000	8.1000	5.2000 (96)
Heat loss rate W	1055.2755	1027.8704	915.7253	734.8298	513.1946	282.5691	137.0724	150.9303	346.7196	604.9417	845.3044	1043.7601 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	358.9149	248.7464	131.7720	27.1975	3.5167	0.0000	0.0000	0.0000	0.0000	54.3294	213.8525	378.8622 (98)
Space heating												1417.1916 (98)
Space heating per m2										(98) / (4) =		21.8905 (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)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1417.1916 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	358.9149	248.7464	131.7720	27.1975	3.5167	0.0000	0.0000	0.0000	0.0000	54.3294	213.8525	378.8622	(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)	358.9149	248.7464	131.7720	27.1975	3.5167	0.0000	0.0000	0.0000	0.0000	54.3294	213.8525	378.8622	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	116.9718	102.3043	105.5689	92.0375	88.3122	76.2067	70.6167	81.0337	82.0015	95.5649	104.3165	113.2810	(64)
Efficiency of water heater (217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(216)
Fuel for water heating, kWh/month	116.9718	102.3043	105.5689	92.0375	88.3122	76.2067	70.6167	81.0337	82.0015	95.5649	104.3165	113.2810	(219)
Water heating fuel used												1128.2157	(219)
Annual totals kWh/year													
Space heating fuel - main system												1417.1916	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 1.4125)													
mechanical ventilation fans (SFP = 1.4125)													292.2956 (230a)
Total electricity for the above, kWh/year													292.2956 (231)
Electricity for lighting (calculated in Appendix L)													290.8350 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 2.10 * 1151 * 1.00) =										-1934.3259		-1934.3259	(233)
Total delivered energy for all uses												1194.2120	(238)

10a. Fuel costs - using BEDF prices (483)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1417.1916	12.2200	173.1808 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1128.2157	12.2200	137.8680 (247)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Energy for lighting	290.8350	19.1200	55.6076 (250)
Additional standing charges			9.0000 (251)
Energy saving/generation technologies			
PV Unit	-1934.3259	19.1200	-369.8431 (252)
Total energy cost			5.8133 (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	1417.1916	0.5190	735.5224 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1128.2157	0.5190	585.5440 (264)
Space and water heating			1321.0664 (265)
Pumps and fans	292.2956	0.5190	151.7014 (267)
Energy for lighting	290.8350	0.5190	150.9433 (268)
Energy saving/generation technologies			
PV Unit	-1934.3259	0.5190	-1003.9151 (269)
Total kg/year			619.7960 (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	1417.1916	3.0700	4350.7781 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1128.2157	3.0700	3463.6223 (264)
Space and water heating			7814.4004 (265)
Pumps and fans	292.2956	3.0700	897.3475 (267)
Energy for lighting	290.8350	3.0700	892.8633 (268)
Energy saving/generation technologies			
PV Unit	-1934.3259	3.0700	-5938.3804 (269)
Primary energy kWh/year			3666.2308 (272)
Primary energy kWh/m2/year			56.6301 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: A 97
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	Recommended
O	Not considered
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U Solar photovoltaic panels	Already installed
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
N Solar water heating	+ 2.1	-£ 78	-345 kg (55.6%)

Recommended measures	Typical annual savings		Energy efficiency	Environmental impact
Solar water heating	£78	5.32 kg/m²	A 99	A 93
Total Savings	£78	5.32 kg/m²		

Potential energy efficiency rating: A 99
Potential environmental impact rating: A 93

Fuel prices for cost data on this page from database revision number 483 TEST (30 Sep 2021)
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	£376	£298	£78
Space heating	£182	£182	£0
Water heating	£138	£60	£78
Lighting	£56	£56	£0
Generated (PV)	-£370	-£370	£0
Total cost of fuels	£6	-£72	£78
Total cost of uses	£6	-£72	£78
Delivered energy	18 kWh/m²	8 kWh/m²	10 kWh/m²
Carbon dioxide emissions	0.6 tonnes	0.3 tonnes	0.3 tonnes
CO2 emissions per m²	10 kg/m²	4 kg/m²	5 kg/m²
Primary energy	57 kWh/m²	25 kWh/m²	31 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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	64.7400 (1b)	x 2.6200 (2b)	= 169.6188 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 169.6188 (5)

2. Ventilation rate

	main		secondary		other		total		m3 per hour			
	heating		heating									
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)			
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)			
Number of intermittent fans							0 * 10 =	0.0000	(7a)			
Number of passive vents							0 * 10 =	0.0000	(7b)			
Number of flueless gas fires							0 * 40 =	0.0000	(7c)			
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000	(8)			
Pressure test								Yes				
Measured/design AP50								5.0000				
Infiltration rate								0.2500	(18)			
Number of sides sheltered								3	(19)			
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.7750	(20)			
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1938	(21)			
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750
	0.2470	0.2422	0.2373	0.2131	0.2083	0.1841	0.1841	0.1792	0.1938	0.2083	0.2180	0.2277
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												75.6500
Effective ac	0.3688	0.3639	0.3591	0.3349	0.3300	0.3058	0.3058	0.3010	0.3155	0.3300	0.3397	0.3494

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	
Window (Uw = 1.20)			19.6300	1.1450	22.4771			(27)
External Wall	17.7100	2.4800	15.2300	0.1800	2.7414	140.0000	2132.2000	(29a)
Dormer Cheek	4.8100		4.8100	0.1800	0.8658	14.0000	67.3400	(29a)
Dormer Frontal Face	35.5800	17.1500	18.4300	0.1800	3.3174	14.0000	258.0200	(29a)
Flat HLR	44.9500		44.9500	0.1200	5.3940	9.0000	404.5500	(30)
Dormer Flat Roof	23.6000		23.6000	0.1200	2.8320	9.0000	212.4000	(30)
Total net area of external elements Aum(A, m2)			126.6500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		37.6277			(33)
Wall to Dwelling			50.2800	0.0000	0.0000	70.0000	3519.6000	(32)
Party Floor			64.7400			80.0000	5179.2000	(32d)
Internal Wall			48.1600			9.0000	433.4400	(32c)
Heat capacity Cm = Sum(A x k)					(28) ... (30) + (32) + (32a) ... (32e) =		12206.7500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							188.5504	(35)
Thermal bridges (Default value 0.150 * total exposed area)							18.9975	(36)
Total fabric heat loss						(33) + (36) =	56.6252	(37)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1120 (42)
Average daily hot water use (litres/day)												84.3601 (43)
Daily hot water use	Jan 92.7961	Feb 89.4217	Mar 86.0473	Apr 82.6729	May 79.2985	Jun 75.9241	Jul 75.9241	Aug 79.2985	Sep 82.6729	Oct 86.0473	Nov 89.4217	Dec 92.7961 (44)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Energy content (annual)	137.6139	120.3580	124.1987	108.2794	103.8967	89.6549	83.0785	95.3338	96.4724	112.4292	122.7253	133.2717 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1327.3126 (45)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
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	116.9718	102.3043	105.5689	92.0375	88.3122	76.2067	70.6167	81.0337	82.0015	95.5649	104.3165	113.2810 (62)
Aperture area of solar collector												3.0000 (H1)
Zero-loss collector efficiency												0.7000 (H2)
Collector heat loss coefficient												1.8000 (H3)
Collector 2nd order heat loss coefficient												0.0050 (H3a)
Collector effective heat loss coefficient												1.8063 (H3b)
Collector performance ratio												2.5804 (H4)
Annual solar radiation per m2												1079.5246 (H5)
Overshading factor												0.8000 (H6)
Solar energy available												1813.6014 (H7)
Adjustment factor for showers												1.0000 (H7a)
Solar-to-load ratio												1.3664 (H8)
Utilisation factor												0.5190 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												84.3601 (H14)
Volume ratio Veff/V												0.8890 (H15)
Solar storage volume factor												0.9765 (H16)
Solar input												-808.1590 (H17)
Solar input	-23.4350	-39.1063	-66.6025	-89.2604	-110.2738	-108.4167	-106.9839	-93.4724	-73.2076	-49.9922	-27.7973	-19.6111 (63)
Solar input (sum of months) = Sum (63)m =												-808.1590 (63)
Output from w/h	93.5368	63.1980	38.9664	2.7771	0.0000	0.0000	0.0000	0.0000	8.7939	45.5727	76.5192	93.6699 (64)
Total per year (kWh/year) = Sum (64)m =												423.0340 (64)
Heat gains from water heating, kWh/month	29.2430	25.5761	26.3922	23.0094	22.0780	19.0517	17.6542	20.2584	20.5004	23.8912	26.0791	28.3202 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	41.1707	36.5674	29.7386	22.5141	16.8295	14.2082	15.3525	19.9557	26.7845	34.0091	39.6936	42.3150 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	275.7075	278.5685	271.3589	256.0105	236.6360	218.4267	206.2617	203.4008	210.6103	225.9587	245.3332	263.5425 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840 (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)	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801 (71)
Water heating gains (Table 5)	39.3051	38.0596	35.4734	31.9575	29.6748	26.4607	23.7287	27.2291	28.4727	32.1118	36.2210	38.0648 (72)
Total internal gains	448.2073	445.2196	428.5950	402.5062	375.1644	351.1196	337.3670	342.6096	357.8917	384.1037	413.2719	435.9464 (73)

6. Solar gains

[Jan]												
Area	19.6300											
Solar flux	11.2829											
Specific data	0.7600											
FF	0.0000											
Access factor	0.7700											
Gains	129.6125											81)
Solar gains	129.6125	263.8300	475.3378	780.6412	1049.3350	1118.7021	1046.5229	834.3002	579.2065	322.4212	163.0861	105.8481 (83)
Total gains	577.8198	709.0497	903.9328	1183.1474	1424.4994	1469.8218	1383.8899	1176.9098	937.0982	706.5249	576.3580	541.7945 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
Jan	43.8835	44.0380	44.1936	44.9885	45.1509	45.9809	45.9809	46.1506	45.6453	45.1509	44.8272	44.5082
alpha	3.9256	3.9359	3.9462	3.9992	4.0101	4.0654	4.0654	4.0767	4.0430	4.0101	3.9885	3.9672
util living area	0.9760	0.9493	0.8713	0.6851	0.4755	0.3189	0.2340	0.2859	0.5243	0.8384	0.9568	0.9807 (86)
MIT	19.9597	20.1730	20.4961	20.7959	20.9042	20.9292	20.9325	20.9316	20.9044	20.6783	20.2598	19.9271 (87)
Th 2	19.9252	19.9286	19.9319	19.9488	19.9521	19.9691	19.9691	19.9725	19.9623	19.9521	19.9454	19.9386 (88)
util rest of house	0.9703	0.9382	0.8465	0.6420	0.4262	0.2684	0.1794	0.2226	0.4532	0.7980	0.9453	0.9761 (89)
MIT 2	18.5578	18.8635	19.3108	19.7054	19.8284	19.8688	19.8712	19.8744	19.8430	19.5800	19.0054	18.5212 (90)
Living area fraction									fLA = Living area / (4) =			0.3732 (91)
MIT	19.0810	19.3522	19.7531	20.1124	20.2299	20.2645	20.2673	20.2689	20.2391	19.9899	19.4735	19.0459 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0810	19.3522	19.7531	20.1124	20.2299	20.2645	20.2673	20.2689	20.2391	19.9899	19.4735	19.0459 (93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9647	0.9310	0.8419	0.6490	0.4395	0.2830	0.1952	0.2410	0.4727	0.7996	0.9390	0.9712	(94)
Useful gains	557.4310	660.1068	761.0014	767.8480	626.0154	415.9176	270.1499	283.5965	442.9660	564.9582	541.2061	526.1640	(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	1142.0865	1112.7642	1016.8494	845.0704	640.5812	417.7172	270.4352	284.2549	456.0424	705.1644	935.9414	1131.0025	(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	434.9837	304.1858	190.3510	55.6002	10.8369	0.0000	0.0000	0.0000	0.0000	104.3134	284.2094	449.9998	(98)
Space heating												1834.4802	(98)
Space heating per m2												28.3361	(99)
											(98) / (4) =		

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													100.0000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													1834.4802	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	434.9837	304.1858	190.3510	55.6002	10.8369	0.0000	0.0000	0.0000	0.0000	104.3134	284.2094	449.9998	(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)	434.9837	304.1858	190.3510	55.6002	10.8369	0.0000	0.0000	0.0000	0.0000	104.3134	284.2094	449.9998	(211)	
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)	
Water heating														
Water heating requirement	93.5368	63.1980	38.9664	2.7771	0.0000	0.0000	0.0000	0.0000	8.7939	45.5727	76.5192	93.6699	(64)	
Efficiency of water heater													100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)	
Fuel for water heating, kWh/month	93.5368	63.1980	38.9664	2.7771	0.0000	0.0000	0.0000	0.0000	8.7939	45.5727	76.5192	93.6699	(219)	
Water heating fuel used													423.0340	(219)
Annual totals kWh/year														
Space heating fuel - main system													1834.4802	(211)
Space heating fuel - secondary													0.0000	(215)
Electricity for pumps and fans:														
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 1.4125)														
mechanical ventilation fans (SFP = 1.4125)													292.2956	(230a)
pump for solar water heating													50.0000	(230g)
Total electricity for the above, kWh/year													342.2956	(231)
Electricity for lighting (calculated in Appendix L)													290.8350	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 2.10 * 1080 * 1.00) =										-1813.6014			-1813.6014	(233)
Total delivered energy for all uses													1077.0435	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1834.4802	6.6100	121.2591	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	423.0340	6.6100	27.9626	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Pump for solar water heating	50.0000	13.1900	6.5950	(249)
Energy for lighting	290.8350	13.1900	38.3611	(250)
Additional standing charges			70.0000	(251)
Energy saving/generation technologies				
PV Unit	-1813.6014	13.1900	-239.2140	(252)
Total energy cost			24.9638	(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] =	0.0955	(257)
SAP value			98.6672	
SAP rating (Section 12)			99	(258)
SAP band			A	

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

Energy	Emission factor	Emissions
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FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

	kWh/year	kg CO2/kWh	kg CO2/year	
Space heating - main system 1	1834.4802	0.5190	952.0952	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	423.0340	0.5190	219.5547	(264)
Space and water heating			1171.6499	(265)
Pumps and fans	342.2956	0.5190	177.6514	(267)
Energy for lighting	290.8350	0.5190	150.9433	(268)
Energy saving/generation technologies				
PV Unit	-1813.6014	0.5190	-941.2591	(269)
Total kg/year			558.9856	(272)
CO2 emissions per m2			8.6300	(273)
EI value			93.1744	
EI rating			93	(274)
EI band			A	

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	64.7400 (1b)	x 2.6200 (2b)	= 169.6188 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 169.6188 (5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour				
Number of chimneys		0	+	0	+	0	=	0 * 40 =	0.0000 (6a)			
Number of open flues		0	+	0	+	0	=	0 * 20 =	0.0000 (6b)			
Number of intermittent fans								0 * 10 =	0.0000 (7a)			
Number of passive vents								0 * 10 =	0.0000 (7b)			
Number of flueless gas fires								0 * 40 =	0.0000 (7c)			
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =							0.0000 / (5) =	0.0000 (8)			
Pressure test								Yes				
Measured/design AP50								5.0000				
Infiltration rate								0.2500	(18)			
Number of sides sheltered								3	(19)			
Shelter factor								(20) = 1 - [0.075 x (19)] =	0.7750 (20)			
Infiltration rate adjusted to include shelter factor								(21) = (18) x (20) =	0.1938 (21)			
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	4.2000	4.0000	4.0000	3.7000	3.8000	3.5000	3.6000	3.4000	3.4000	3.7000	3.5000	4.0000 (22)
Adj infilt rate	1.0500	1.0000	1.0000	0.9250	0.9500	0.8750	0.9000	0.8500	0.8500	0.9250	0.8750	1.0000 (22a)
	0.2034	0.1938	0.1938	0.1792	0.1841	0.1695	0.1744	0.1647	0.1647	0.1792	0.1695	0.1938 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												75.6500 (23c)
Effective ac	0.3252	0.3155	0.3155	0.3010	0.3058	0.2913	0.2961	0.2864	0.2864	0.3010	0.2913	0.3155 (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	
Window (Uw = 1.20)			19.6300	1.1450	22.4771			(27)
External Wall	17.7100	2.4800	15.2300	0.1800	2.7414	140.0000	2132.2000	(29a)
Dormer Cheek	4.8100		4.8100	0.1800	0.8658	14.0000	67.3400	(29a)
Dormer Frontal Face	35.5800	17.1500	18.4300	0.1800	3.3174	14.0000	258.0200	(29a)
Flat HLR	44.9500		44.9500	0.1200	5.3940	9.0000	404.5500	(30)
Dormer Flat Roof	23.6000		23.6000	0.1200	2.8320	9.0000	212.4000	(30)
Total net area of external elements Aum(A, m2)			126.6500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...	(30) + (32) =	37.6277			(33)
Wall to Dwelling			50.2800	0.0000	0.0000	70.0000	3519.6000	(32)
Party Floor			64.7400			80.0000	5179.2000	(32d)
Internal Wall			48.1600			9.0000	433.4400	(32c)
Heat capacity Cm = Sum(A x k)					(28)...	(30) + (32) + (32a)...	(32e) =	12206.7500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								188.5504 (35)
Thermal bridges (Default value 0.150 * total exposed area)								18.9975 (36)
Total fabric heat loss						(33) + (36) =		56.6252 (37)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1120 (42)
Average daily hot water use (litres/day)												84.3601 (43)
Daily hot water use	Jan 92.7961	Feb 89.4217	Mar 86.0473	Apr 82.6729	May 79.2985	Jun 75.9241	Jul 75.9241	Aug 79.2985	Sep 82.6729	Oct 86.0473	Nov 89.4217	Dec 92.7961 (44)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

Energy content (annual)	137.6139	120.3580	124.1987	108.2794	103.8967	89.6549	83.0785	95.3338	96.4724	112.4292	122.7253	133.2717 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1327.3126 (45)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
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	116.9718	102.3043	105.5689	92.0375	88.3122	76.2067	70.6167	81.0337	82.0015	95.5649	104.3165	113.2810 (62)
Aperture area of solar collector												3.0000 (H1)
Zero-loss collector efficiency												0.7000 (H2)
Collector heat loss coefficient												1.8000 (H3)
Collector 2nd order heat loss coefficient												0.0050 (H3a)
Collector effective heat loss coefficient												1.8063 (H3b)
Collector performance ratio												2.5804 (H4)
Annual solar radiation per m2												1151.3844 (H5)
Overshading factor												0.8000 (H6)
Solar energy available												1934.3259 (H7)
Adjustment factor for showers												1.0000 (H7a)
Solar-to-load ratio												1.4573 (H8)
Utilisation factor												0.4965 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												84.3601 (H14)
Volume ratio Veff/V												0.8890 (H15)
Solar storage volume factor												0.9765 (H16)
Solar input												-824.6185 (H17)
Solar input	-25.9312	-37.7218	-64.8407	-89.5438	-106.9299	-112.4351	-109.7994	-97.6372	-76.3421	-52.9248	-29.7220	-20.7906 (63)
Solar input (sum of months) = Sum (63)m =												-824.6185 (63)
Output from w/h	91.0407	64.5825	40.7282	2.4938	0.0000	0.0000	0.0000	0.0000	5.6594	42.6400	74.5945	92.4904 (64)
Total per year (kWh/year) = Sum (64)m =												414.2295 (64)
Heat gains from water heating, kWh/month	29.2430	25.5761	26.3922	23.0094	22.0780	19.0517	17.6542	20.2584	20.5004	23.8912	26.0791	28.3202 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	41.1707	36.5674	29.7386	22.5141	16.8295	14.2082	15.3525	19.9557	26.7845	34.0091	39.6936	42.3150 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	275.7075	278.5685	271.3589	256.0105	236.6360	218.4267	206.2617	203.4008	210.6103	225.9587	245.3332	263.5425 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840 (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)	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801 (71)
Water heating gains (Table 5)	39.3051	38.0596	35.4734	31.9575	29.6748	26.4607	23.7287	27.2291	28.4727	32.1118	36.2210	38.0648 (72)
Total internal gains	448.2073	445.2196	428.5950	402.5062	375.1644	351.1196	337.3670	342.6096	357.8917	384.1037	413.2719	435.9464 (73)

6. Solar gains

[Jan]												
Area	19.6300											
Solar flux	13.3498											
Specific data	0.7600											
FF	0.0000											
Access factor	0.7700											
Gains	153.3553											153.3553 (81)
Solar gains	153.3553	273.3590	498.4206	841.5357	1088.4670	1237.7398	1147.2730	934.8519	650.3299	367.2180	186.7385	119.7986 (83)
Total gains	601.5626	718.5786	927.0156	1244.0418	1463.6314	1588.8595	1484.6400	1277.4616	1008.2216	751.3217	600.0104	555.7451 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
Jan	45.3145	45.6453	45.6453	46.1506	45.9809	46.4938	46.3216	46.6673	46.6673	46.1506	46.4938	45.6453
alpha	4.0210	4.0430	4.0430	4.0767	4.0654	4.0996	4.0881	4.1112	4.1112	4.0767	4.0996	4.0430
util living area	0.9664	0.9361	0.8292	0.5967	0.3829	0.2109	0.1282	0.1592	0.3910	0.7536	0.9363	0.9738 (86)
MIT	20.1223	20.3062	20.6267	20.8643	20.9233	20.9334	20.9338	20.9341	20.9268	20.7949	20.4194	20.0784 (87)
Th 2	19.9555	19.9623	19.9623	19.9725	19.9691	19.9793	19.9759	19.9827	19.9827	19.9725	19.9793	19.9623 (88)
util rest of house	0.9584	0.9220	0.7979	0.5495	0.3334	0.1642	0.0777	0.1014	0.3209	0.6987	0.9194	0.9673 (89)
MIT 2	18.8149	19.0788	19.5107	19.8070	19.8639	19.8823	19.8789	19.8862	19.8820	19.7400	19.2569	18.7580 (90)
Living area fraction												0.3732 (91)
MIT	19.3028	19.5368	19.9272	20.2015	20.2592	20.2746	20.2726	20.2773	20.2719	20.1337	19.6907	19.2507 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3028	19.5368	19.9272	20.2015	20.2592	20.2746	20.2726	20.2773	20.2719	20.1337	19.6907	19.2507 (93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9523	0.9153	0.7968	0.5603	0.3474	0.1777	0.0923	0.1181	0.3411	0.7080	0.9138	0.9618	(94)
Useful gains	572.8630	657.7120	738.6125	697.0555	508.4679	282.3734	137.0651	150.9098	343.8819	531.9183	548.2871	534.5367	(95)
Ext temp.	5.2000	5.7000	7.6000	10.2000	13.3000	16.4000	18.4000	18.2000	15.5000	11.9000	8.1000	5.2000	(96)
Heat loss rate W	1055.2755	1027.8704	915.7253	734.8298	513.1946	282.5691	137.0724	150.9303	346.7196	604.9417	845.3044	1043.7601	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	358.9149	248.7464	131.7720	27.1975	3.5167	0.0000	0.0000	0.0000	0.0000	54.3294	213.8525	378.8622	(98)
Space heating												1417.1916	(98)
Space heating per m2											(98) / (4) =	21.8905	(99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													100.0000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													1417.1916	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	358.9149	248.7464	131.7720	27.1975	3.5167	0.0000	0.0000	0.0000	0.0000	54.3294	213.8525	378.8622	(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)	358.9149	248.7464	131.7720	27.1975	3.5167	0.0000	0.0000	0.0000	0.0000	54.3294	213.8525	378.8622	(211)	
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)	
Water heating														
Water heating requirement	91.0407	64.5825	40.7282	2.4938	0.0000	0.0000	0.0000	0.0000	5.6594	42.6400	74.5945	92.4904	(64)	
Efficiency of water heater	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(216)	
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)	
Fuel for water heating, kWh/month	91.0407	64.5825	40.7282	2.4938	0.0000	0.0000	0.0000	0.0000	5.6594	42.6400	74.5945	92.4904	(219)	
Water heating fuel used												414.2295	(219)	
Annual totals kWh/year												1417.1916	(211)	
Space heating fuel - main system												1417.1916	(211)	
Space heating fuel - secondary												0.0000	(215)	
Electricity for pumps and fans:														
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 1.4125)														
mechanical ventilation fans (SFP = 1.4125)													292.2956	(230a)
pump for solar water heating													50.0000	(230g)
Total electricity for the above, kWh/year													342.2956	(231)
Electricity for lighting (calculated in Appendix L)													290.8350	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 2.10 * 1151 * 1.00) =									-1934.3259			-1934.3259	(233)	
Total delivered energy for all uses												530.2258	(238)	

10a. Fuel costs - using BEDF prices (483)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1417.1916	12.2200	173.1808	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	414.2295	12.2200	50.6188	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Pump for solar water heating	50.0000	19.1200	9.5600	(249)
Energy for lighting	290.8350	19.1200	55.6076	(250)
Additional standing charges			9.0000	(251)
Energy saving/generation technologies				
PV Unit	-1934.3259	19.1200	-369.8431	(252)
Total energy cost			-71.8758	(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	1417.1916	0.5190	735.5224	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	414.2295	0.5190	214.9851	(264)
Space and water heating			950.5075	(265)
Pumps and fans	342.2956	0.5190	177.6514	(267)
Energy for lighting	290.8350	0.5190	150.9433	(268)
Energy saving/generation technologies				
PV Unit	-1934.3259	0.5190	-1003.9151	(269)
Total kg/year			275.1872	(272)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

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	1417.1916	3.0700	4350.7781	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	414.2295	3.0700	1271.6846	(264)
Space and water heating			5622.4628	(265)
Pumps and fans	342.2956	3.0700	1050.8475	(267)
Energy for lighting	290.8350	3.0700	892.8633	(268)
Energy saving/generation technologies				
PV Unit	-1934.3259	3.0700	-5938.3804	(269)
Primary energy kWh/year			1627.7932	(272)
Primary energy kWh/m2/year			25.1435	(273)

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Designed)



Property Reference	210927	Issued on Date	20/10/2021
Assessment Reference	APARTMENT 3.03	Prop Type Ref	APARTMENT 3.03
Property	UB7 7QR		

SAP Rating	97 A	DER	17.43	TER	28.29
Environmental	89 B	% DER<TER	38.40		
CO ₂ Emissions (t/year)	0.62	DFEE	51.63	TFEE	54.21
General Requirements Compliance	Fail	% DFEE<TFEE	4.76		

Assessor Details	Mr. Dion Mellows, SHA Environmental Limited, Tel: 02036370427, info@shaenvironmental.co.uk	Assessor ID	G297-0001
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Client	
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SUMMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Electricity		
Fuel factor	1.55 (electricity)		
Target Carbon Dioxide Emission Rate (TER)	28.29	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	17.43	kgCO ₂ /m ²	Pass
	-10.86 (-38.4%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	54.21	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	51.63	kWh/m ² /yr	
	-2.6 (-4.8%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Roof	0.12 (max. 0.20)	0.12 (max. 0.35)	Pass
Openings	1.20 (max. 2.00)	1.20 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated using default γ -value of 0.15

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system	Electric underfloor heating - Electric Underfloor heating in thin screed (standard tariff)	
Secondary heating system	None	

5 Cylinder insulation

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Designed)



Hot water storage

No cylinder

6 Controls

Space heating controls

Time and temperature zone control

Pass

Hot water controls

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100

%

Minimum

75

%

Pass

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power

1.13

Maximum

1.5

Pass

MVHR efficiency

89

%

Minimum

70

%

Pass

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)

High

Fail

Based on:

Overshading

Average

Windows facing North West

19.63 m², No overhang

Air change rate

4.00 ach

Blinds/curtains

Dark-coloured curtain or roller blind, closed 50% of daylight hours

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

5.00 (design value)

Maximum

10.0

Pass

10 Key features

Party wall U-value

0.00

W/m²K

Roof U-value

0.12

W/m²K

Roof U-value

0.12

W/m²K

Photovoltaic array

2.10

kW

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)



Property Reference	210927	Issued on Date	20/10/2021
Assessment Reference	APARTMENT 3.03	Prop Type Ref	APARTMENT 3.03
Property	UB7 7QR		

SAP Rating	97 A	DER	17.43	TER	28.29
Environmental	89 B	% DER<TER	38.40		
CO ₂ Emissions (t/year)	0.62	DFEE	51.63	TFEE	54.21
General Requirements Compliance	Fail	% DFEE<TFEE	4.76		

Assessor Details	Mr. Dion Mellows, SHA Environmental Limited, Tel: 02036370427, info@shaenvironmental.co.uk	Assessor ID	G297-0001
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Client	
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SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

Orientation	South East
Property Tenure	Unknown
Transaction Type	None of the above
Terrain Type	Urban
1.0 Property Type	House, Semi-Detached
2.0 Number of Storeys	1
3.0 Date Built	2021
4.0 Sheltered Sides	3
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements				
	Ground Floor:	Heat Loss Perimeter 19.88 m	Internal Floor Area 64.74 m ²	Average Storey Height 2.62 m

7.0 Living Area	24.16	m ²
8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	188.55	kJ/m ² K

9.0 External Walls						
Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
External Wall	Cavity Wall	Cavity wall; dense plaster, lightweight aggregate block, filled cavity, any outside structure	0.18	140.00	17.71	15.23
Dormer Cheek	Steel Frame	Steel frame wall (warm frame or hybrid construction)	0.18	14.00	4.81	4.81
Dormer Frontal Face	Steel Frame	Steel frame wall (warm frame or hybrid construction)	0.18	14.00	35.58	18.43

9.1 Party Walls						
Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)	
Wall to Dwelling	Filled Cavity with Edge Sealing	Single plasterboard on dabs on both sides, dense blocks, cavity or cavity fill	0.00	70.00	50.28	

9.2 Internal Walls						
Description	Construction			Kappa (kJ/m ² K)	Area (m ²)	
Internal Wall	Plasterboard on timber frame			9.00	48.16	

10.0 External Roofs

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)



Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area (m²)	Nett Area (m²)
Flat HLR	External Flat Roof	Plasterboard, insulated flat roof	0.12	9.00	44.95	44.95
Dormer Flat Roof	External Flat Roof	Plasterboard, insulated flat roof	0.12	9.00	23.60	23.60

11.1 Party Floors

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor	Concrete floor slab, carpeted	80.00	64.74

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Window	BFRC data	Window	Double glazed			0.76			1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
NW1	Window	[1] External Wall	North West	Dark-coloured curtain or roller blind	0.00					2.48	50
NW2	Window	[3] Dormer Frontal Face	North West	Dark-coloured curtain or roller blind	0.00					6.00	50
NW3	Window	[3] Dormer Frontal Face	North West	Dark-coloured curtain or roller blind	0.00					2.15	50
NW4	Window	[3] Dormer Frontal Face	North West	Dark-coloured curtain or roller blind	0.00					4.50	50
NW5	Window	[3] Dormer Frontal Face	North West	Dark-coloured curtain or roller blind	0.00					4.50	50

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	
17.0 Thermal Bridging	Default	
Y-value	0.150	W/m²K
18.0 Pressure Testing	Yes	
Designed AP ₅₀	5.00	m³/(h.m²) @ 50 Pa
Property Tested ?		
As Built AP ₅₀		m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather	Windows fully open
Cross ventilation possible	No
Night Ventilation	No
Air change rate	4.00

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)



Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500029
Configuration	2
MVHR Duct Insulated	Yes
Manufacturer SFP	1.13
Duct Type	Rigid
MVHR Efficiency	89.00
Wet Rooms	2

20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				0
Number of passive vents				0
Number of flueless gas fires				0

21.0 Fixed Cooling System

No

22.0 Lighting

Internal

Total number of light fittings	25	
Total number of L.E.L. fittings	25	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted	No
------------------------	----

23.0 Electricity Tariff

24 Hour

24.0 Main Heating 1

Description	SAP table	
Percentage of Heat	Underfloor Electric Heating	
Main Heating	100	%
SAP Code	SEH	
Efficiency (SAP Table)	424	
Controls	100.0	%
Sap Code	CMD Time and temperature zone control	
	2706	

25.0 Main Heating 2

None

Community Heating	None
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28.0 Water Heating

Water Heating	HES Instantaneous at point of use
Flue Gas Heat Recovery System	Independent
Waste Water Heat Recovery	No
Instantaneous System 1	No

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)



Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
SAP Code	909

29.0 Hot Water Cylinder

32.0 Photovoltaic Unit

PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
2.10	South	30°	None Or Little	Yes

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

	Typical Cost	Typical savings per year	Ratings after improvement	
			SAP rating	Environmental Impact
Solar water heating	£4,000 - £6,000	£78	A 99	

BLOCK COMPLIANCE

Calculation Type: New Build (As Designed)



Block Reference	000122	Issued on Date	20/10/2021
Block Name	Proposed Case		
Assessor Details	Mr. Dion Mellows, SHA Environmental Limited, Tel: 02036370427, info@shaenvironmental.co.uk		Assessor ID
			G297-0001
Client			

Block Compliance Report - DER

Block Reference: 000122		Block Name: Proposed Case			
Property-Assessment Reference	Multiplier	Floor Area (m ²)	DER (kgCO ₂ /m ²)	TER (kgCO ₂ /m ²)	% DER/TER
210925-APARTMENT 3.01	1	64.74	16.03	25.05	36.01 %
210926-APARTMENT 3.02	1	64.74	16.03	25.05	36.01 %
210927-APARTMENT 3.03	1	64.74	17.43	28.29	38.40 %
210928-APARTMENT 3.04	1	64.74	17.43	28.29	38.40 %
Totals:	4	258.96	66.92	106.69	
Average DER = 16.73 kgCO ₂ /m ²		% DER/TER	PASS		
Average TER = 26.67 kgCO ₂ /m ²		37.27 %			

Block Compliance Report - DFEE

Block Reference: 000122		Block Name: Proposed Case			
Property-Assessment Reference	Multiplier	Floor Area (m ²)	DFEE (kWh/m ² /yr)	TFEE (kWh/m ² /yr)	% DFEE/TFEE
210925-APARTMENT 3.01	1	64.74	38.41	43.48	11.66 %
210926-APARTMENT 3.02	1	64.74	38.41	43.48	11.66 %
210927-APARTMENT 3.03	1	64.74	51.63	54.21	4.76 %
210928-APARTMENT 3.04	1	64.74	51.63	54.21	4.76 %
Totals:	4	258.96	180.08	195.39	
Average DFEE = 45.02 kWh/m ² /yr		% DFEE/TFEE	PASS		
Average TFEE = 48.85 kWh/m ² /yr		7.84 %			

DWELLING SIGN OFF REPORT



Section 1: Dwelling Information

Dwelling Address (Please confirm final postal address and post code of the dwelling.)

House Name		
House Number		
Postcode	UB7 7QR	
Street		
Locality		
Town		
County		

Dwelling Orientation South East (Please confirm orientation of main entrance door of the dwelling.)

Comments

Terrain Type Urban

Property Type House, Semi-Detached

Comments

Overshading (called Sunlight/shade in assessment) Average or unknown

Comments

Section 2: Dwelling Construction Details

Thermal Mass Parameter Precise calculation

Thermal Mass 188.55 kJ/m²K

Comments

External Walls

Type	Cavity Wall		
Construction	Cavity wall; dense plaster, lightweight aggregate block, filled cavity, any outside structure		
U-value	0.18	W/m ² K	U-value calculations should be provided to verify the u-value entered in the survey.
Gross Area	17.71	m ²	
Type	Steel Frame		
Construction	Steel frame wall (warm frame or hybrid construction)		
U-value	0.18	W/m ² K	U-value calculations should be provided to verify the u-value entered in the survey.
Gross Area	4.81	m ²	
Type	Steel Frame		
Construction	Steel frame wall (warm frame or hybrid construction)		
U-value	0.18	W/m ² K	U-value calculations should be provided to verify the u-value entered in the survey.
Gross Area	35.58	m ²	

Comments

Party Walls

DWELLING SIGN OFF REPORT



Type	Construction	U-Value (W/m²K)	Area (m²)
Filled Cavity with Edge Sealing	Single plasterboard on dabs on both sides, dense blocks, cavity or cavity fill	0.00	50.28
Comments			

External Roofs

Type	External Flat Roof		
Construction	Plasterboard, insulated flat roof		
U-value	0.12	W/m²K	U-value calculations should be provided to verify the u-value entered in the survey.
Gross Area	44.95	m²	
Type	External Flat Roof		
Construction	Plasterboard, insulated flat roof		
U-value	0.12	W/m²K	U-value calculations should be provided to verify the u-value entered in the survey.
Gross Area	23.60	m²	

Comments

Opening Types

Description	Type	Glazing	Frame Type	U Value (W/m²K)
Window	Window	Double glazed		1.20
Comments				

Openings

Name	Opening Type	Location	Orientation	Area (m²)
NW1	Window	[1] External Wall	North West	2.48
NW2	Window	[3] Dormer Frontal Face	North West	6.00
NW3	Window	[3] Dormer Frontal Face	North West	2.15
NW4	Window	[3] Dormer Frontal Face	North West	4.50
NW5	Window	[3] Dormer Frontal Face	North West	4.50

Comments

Thermal Bridging

	Default	
Y-value	0.150	W/m²K
Comments		

DWELLING SIGN OFF REPORT



Where specific construction details have been used documentary evidence should be provided to the SAP assessor, usually in the form of signed checklists.

Pressure Testing

Yes

As Built AP₅₀

m³/(h.m²) @ 50 Pa

Where an air pressure test has been carried out a copy of the test certificate should be forwarded to the SAP assessor.

Comments

Section 3: Dwelling Systems

Mechanical Ventilation

Type

Brand Model

SFP

Efficiency

Duct Type

Duct Brand Model

Number of Wet Rooms

Comments

Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				0
Number of passive vents				0
Number of flueless gas fires				0

Comments

Internal Lighting

Total number of light fittings

Total number of L.E.L. fittings

Percentage of L.E.L. fittings %

Comments

External Lighting

External lights fitted

Comments

DWELLING SIGN OFF REPORT



Electricity Tariff	24 Hour
Comments	

Main Heating 1	SAP table
Fuel Type	electricity
Main Heating	Electricity SEH Underfloor heating in thin screed (standard tariff)
Efficiency (SAP Table)	100.0 %
Brand, Model	
Flue Type	
Fan Assisted Flue	
Heat Emitter	
Flow Temperature	
Comments	

Heating Controls

Description	CMD Time and temperature zone control
Boiler Interlock	
Delayed Start Stat	
Compensator	
Comments	

Main Heating 2	None
Comments	

Water Heating System	HES Instantaneous at point of use
Water Heating	Independent
Supplementary Immersion	
Comments	

Section 4: Dwelling Renewable Energy

Photovoltaic Panels	One Dwelling			
PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
2.10	South	30°	None Or Little	Yes
MCS Certificate available?				

DWELLING SIGN OFF REPORT



Comments

Section 5: Declaration

I confirm that all details provided above are accurate to the best of my knowledge.

Signed

Date



SAP Report Submission for Building Regulations Compliance

Client:

Project:

UB7 7QR

Contact: Dion Mellows
SHA Environmental Limited
info@shaenvironmental.co.uk

Report Issue Date: 20/10/2021

EXCELLENCE
IN ENERGY
ASSESSMENT

PREDICTED ENERGY ASSESSMENT



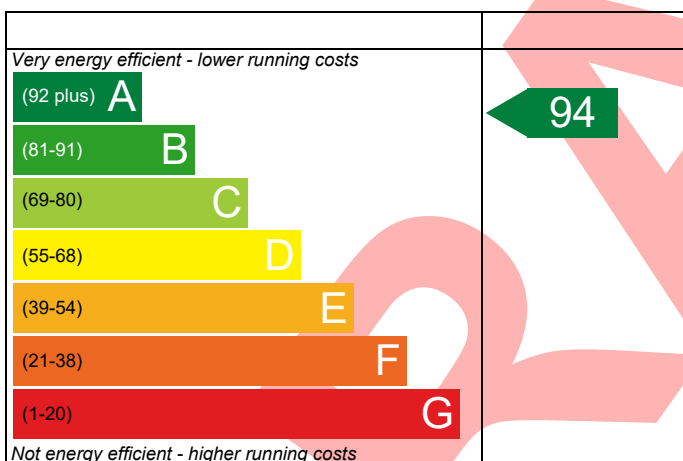
UB7 7QR

Dwelling type: House, Semi-Detached
 Date of assessment: 20/10/2021
 Produced by: SHA Environmental Limited
 Total floor area: 64.74 m²

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP2012 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.

Energy Efficiency Rating

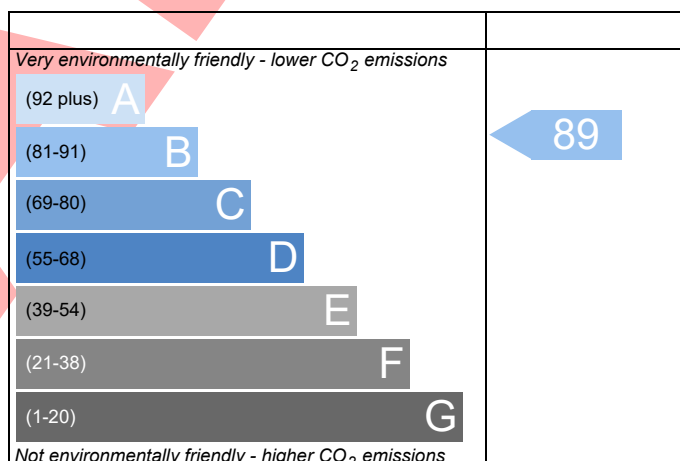


England

EU Directive
2002/91/EC

The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

Environmental Impact (CO₂) Rating



England

EU Directive
2002/91/EC

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO₂) emissions. The higher the rating the less impact it has on the environment.

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Designed)



Property Reference	210926	Issued on Date	20/10/2021
Assessment Reference	APARTMENT 3.02	Prop Type Ref	APARTMENT 3.02
Property	UB7 7QR		
SAP Rating	94 A	DER	16.03
Environmental	89 B	TER	25.05
CO ₂ Emissions (t/year)	0.71	% DER<TER	36.01
General Requirements Compliance	Pass	DFEE	38.41
		TREE	43.48
		% DFEE<TFEE	11.66
Assessor Details	Mr. Dion Mellows, SHA Environmental Limited, Tel: 02036370427, info@shaenvironmental.co.uk		Assessor ID
			G297-0001
Client			

SUMMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFE rate

1a TER and DER

Fuel for main heating	Electricity		
Fuel factor	1.55 (electricity)		
Target Carbon Dioxide Emission Rate (TER)	25.05	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	16.03	kgCO ₂ /m ²	Pass
	-9.02 (-36.0%)	kgCO ₂ /m ²	

1b TFE and DFEE

Target Fabric Energy Efficiency (TFEE)	43.48	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	38.41	kWh/m ² /yr	
	-5.1 (-11.7%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Roof	0.12 (max. 0.20)	0.12 (max. 0.35)	Pass
Openings	1.20 (max. 2.00)	1.20 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated using default γ -value of 0.15

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)	m ³ /(h.m ²) @ 50 Pa	
Maximum	10.0	m ³ /(h.m ²) @ 50 Pa	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system	Electric underfloor heating - Electric Underfloor heating in thin screed (standard tariff)	
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This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Designed)



Secondary heating system

None

5 Cylinder insulation

Hot water storage

No cylinder

6 Controls

Space heating controls

Time and temperature zone control

Pass

Hot water controls

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100

%

Minimum

75

%

Pass

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power

1.13

Maximum

1.5

Pass

MVHR efficiency

89

%

Minimum

70

%

Pass

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)

Medium

Pass

Based on:

Overshading

Average

Windows facing South East

19.63 m², No overhang

Air change rate

6.00 ach

Blinds/curtains

Dark-coloured curtain or roller blind, closed 50% of daylight hours

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

5.00 (design value)

m³/(h.m²) @ 50 Pa

Maximum

10.0

m³/(h.m²) @ 50 Pa

Pass

10 Key features

Party wall U-value

0.00

W/m²K

Roof U-value

0.12

W/m²K

Roof U-value

0.12

W/m²K

Photovoltaic array

1.20

kW

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

RECOMMENDATIONS

	Typical cost	Typical savings per year	Energy efficiency	Environmental impact	Result
Low energy lights			0	0	Already installed
Solar water heating	£4,000 - £6,000	£78	A 96	A 93	Recommended
Photovoltaic			0	0	Already installed
Wind turbine			0	0	Not applicable
Totals	£4,000 - £6,000	£78	A 96	A 93	

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	210926	Issued on Date	20/10/2021
Assessment Reference	APARTMENT 3.02	Prop Type Ref	APARTMENT 3.02
Property	UB7 7QR		

SAP Rating	94 A	DER	16.03	TER	25.05
Environmental	89 B	% DER<TER	36.01		
CO ₂ Emissions (t/year)	0.71	DFEE	38.41	TFEE	43.48
General Requirements Compliance	Pass	% DFEE<TFEE	11.66		

Assessor Details	Mr. Dion Mellows, SHA Environmental Limited, Tel: 02036370427, info@shaenvironmental.co.uk	Assessor ID	G297-0001
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Client	
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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	64.7400 (1b)	x 2.6200 (2b)	= 169.6188 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 169.6188 (5)

2. Ventilation rate

						main	secondary	other		total	m3 per hour		
						heating	heating						
Number of chimneys						0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues						0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans												0 * 10 =	0.0000 (7a)
Number of passive vents												0 * 10 =	0.0000 (7b)
Number of flueless gas fires												0 * 40 =	0.0000 (7c)
												Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =										0.0000 / (5) =		0.0000 (8)	
Pressure test												Yes	
Measured/design AP50												5.0000	
Infiltration rate												0.2500 (18)	
Number of sides sheltered												3 (19)	
Shelter factor										(20) = 1 - [0.075 x (19)] =		0.7750 (20)	
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =		0.1938 (21)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	4.0000	3.7000	3.8000	3.5000	3.6000	3.4000	3.4000	3.7000	3.5000	4.0000	(22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9500	0.8750	0.9000	0.8500	0.8500	0.9250	0.8750	1.0000	(22a)
Adj infiltr rate	0.2034	0.1938	0.1938	0.1792	0.1841	0.1695	0.1744	0.1647	0.1647	0.1792	0.1695	0.1938	(22b)
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation:													0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													75.6500 (23c)
Effective ac	0.3252	0.3155	0.3155	0.3010	0.3058	0.2913	0.2961	0.2864	0.2864	0.3010	0.2913	0.3155	(25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Window (Uw = 1.20)			19.6300	1.1450	22.4771		(27)
External Wall	17.7100	2.4800	15.2300	0.1800	2.7414	140.0000	2132.2000 (29a)
Dormer Cheek	4.8100		4.8100	0.1800	0.8658	14.0000	67.3400 (29a)
Dormer Frontal Face	35.5800	17.1500	18.4300	0.1800	3.3174	14.0000	258.0200 (29a)
Flat HLR	44.9500		44.9500	0.1200	5.3940	9.0000	404.5500 (30)
Dormer Flat Roof	23.6000		23.6000	0.1200	2.8320	9.0000	212.4000 (30)
Total net area of external elements Aum(A, m ²)			126.6500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		37.6277		(33)
Wall to Dwelling			50.2800	0.0000	0.0000	70.0000	3519.6000 (32)
Party Floor			64.7400			80.0000	5179.2000 (32d)
Internal Wall			48.1600			9.0000	433.4400 (32c)
Heat capacity Cm = Sum (A x k)						(28)...(30) + (32) + (32a)...(32e) =	12206.7500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							188.5504 (35)
Thermal bridges (Default value 0.150 * total exposed area)							18.9975 (36)

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CALCULATION OF HEAT DEMAND 09 Jan 2014

Total fabric heat loss (33) + (36) = 56.6252 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	18.2021	17.6599	17.6599	16.8465	17.1176	16.3042	16.5754	16.0331	16.0331	16.8465	16.3042	17.6599	(38)
Heat transfer coeff	74.8273	74.2851	74.2851	73.4717	73.7428	72.9294	73.2006	72.6583	72.6583	73.4717	72.9294	74.2851	(39)
Average = Sum(39)m / 12 =												73.5621	(39)
HLP	1.1558	1.1474	1.1474	1.1349	1.1391	1.1265	1.1307	1.1223	1.1223	1.1349	1.1265	1.1474	(40)
HLP (average)												1.1363	(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 2.1120 (42)
Average daily hot water use (litres/day) 84.3601 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	92.7961	89.4217	86.0473	82.6729	79.2985	75.9241	75.9241	79.2985	82.6729	86.0473	89.4217	92.7961	(44)
Energy conte	137.6139	120.3580	124.1987	108.2794	103.8967	89.6549	83.0785	95.3338	96.4724	112.4292	122.7253	133.2717	(45)
Energy content (annual)										Total = Sum(45)m =		1327.3126	(45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
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	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)
Solar input	116.9718	102.3043	105.5689	92.0375	88.3122	76.2067	70.6167	81.0337	82.0015	95.5649	104.3165	113.2810	(62)
Solar input (sum of months) = Sum(63)m =	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	116.9718	102.3043	105.5689	92.0375	88.3122	76.2067	70.6167	81.0337	82.0015	95.5649	104.3165	113.2810	(64)
RHI water heating demand													
Heat gains from water heating, kWh/month	29.2430	25.5761	26.3922	23.0094	22.0780	19.0517	17.6542	20.2584	20.5004	23.8912	26.0791	28.3202	(65)
Total per year (kWh/year) = Sum(64)m =												1128	(64)

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	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	41.1707	36.5674	29.7386	22.5141	16.8295	14.2082	15.3525	19.9557	26.7845	34.0091	39.6936	42.3150	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	275.7075	278.5685	271.3589	256.0105	236.6360	218.4267	206.2617	203.4008	210.6103	225.9587	245.3332	263.5425	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	(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)	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	(71)
Water heating gains (Table 5)	39.3051	38.0596	35.4734	31.9575	29.6748	26.4607	23.7287	27.2291	28.4727	32.1118	36.2210	38.0648	(72)
Total internal gains	448.2073	445.2196	428.5950	402.5062	375.1644	351.1196	337.3670	342.6096	357.8917	384.1037	413.2719	435.9464	(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		
Southeast	19.6300				41.7137		0.7600		0.0000		0.7700		479.1849 (77)
Solar gains	479.1849	710.6295	981.9314	1259.0738	1370.0142	1458.1619	1389.7860	1290.7377	1140.3671	861.8539	554.3509	393.1141	(83)
Total gains	927.3922	1155.8491	1410.5264	1661.5799	1745.1786	1809.2816	1727.1530	1633.3473	1498.2588	1245.9576	967.6229	829.0605	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)														
tau	45.3145	45.6453	45.6453	46.1506	45.9809	46.4938	46.3216	46.6673	46.6673	46.1506	46.4938	45.6453		
alpha	4.0210	4.0430	4.0430	4.0767	4.0654	4.0996	4.0881	4.1112	4.1112	4.0767	4.0996	4.0430		
util living area	0.8847	0.7949	0.6444	0.4650	0.3231	0.1853	0.1102	0.1245	0.2659	0.5161	0.7924	0.9129	(86)	
MIT	20.4448	20.6388	20.8162	20.9054	20.9280	20.9336	20.9338	20.9341	20.9324	20.8990	20.6978	20.3698	(87)	
Th 2	19.9555	19.9623	19.9623	19.9725	19.9691	19.9793	19.9759	19.9827	19.9827	19.9725	19.9793	19.9623	(88)	
util rest of house	0.8640	0.7654	0.6058	0.4240	0.2806	0.1442	0.0668	0.0793	0.2171	0.4636	0.7571	0.8958	(89)	

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MIT 2	19.2587	19.5183	19.7379	19.8484	19.8675	19.8824	19.8789	19.8862	19.8853	19.8446	19.6167	19.1639 (90)
Living area fraction									fLA = Living area / (4) =			0.3732 (91)
MIT	19.7013	19.9365	20.1403	20.2428	20.2633	20.2747	20.2726	20.2773	20.2761	20.2381	20.0201	19.6139 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7013	19.9365	20.1403	20.2428	20.2633	20.2747	20.2726	20.2773	20.2761	20.2381	20.0201	19.6139 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8583	0.7646	0.6126	0.4349	0.2928	0.1561	0.0794	0.0924	0.2312	0.4775	0.7586	0.8893	(94)
Useful gains	795.9897	883.7355	864.1195	722.6287	510.9794	282.4626	137.0692	150.9252	346.3685	594.8967	734.0866	737.2724	(95)
Ext temp.	5.2000	5.7000	7.6000	10.2000	13.3000	16.4000	18.4000	18.2000	15.5000	11.9000	8.1000	5.2000	(96)
Heat loss rate W													
	1085.0963	1057.5559	931.5582	737.8649	513.4919	282.5805	137.0732	150.9329	347.0211	612.6136	869.3273	1070.7383	(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													
	215.0953	116.8073	50.1744	10.9701	1.8693	0.0000	0.0000	0.0000	0.0000	13.1814	97.3733	248.0987	(98)
Space heating												753.5698	(98)
RHI space heating demand												754	(98)

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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	64.7400 (1b)	x 2.6200 (2b)	= 169.6188 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 169.6188 (5)

2. Ventilation rate

	main		secondary		other		total		m3 per hour			
	heating		heating									
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)			
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)			
Number of intermittent fans							0 * 10 =	0.0000	(7a)			
Number of passive vents							0 * 10 =	0.0000	(7b)			
Number of flueless gas fires							0 * 40 =	0.0000	(7c)			
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000	(8)			
Pressure test								Yes				
Measured/design AP50								5.0000				
Infiltration rate								0.2500	(18)			
Number of sides sheltered								3	(19)			
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.7750	(20)			
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1938	(21)			
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750
	0.2470	0.2422	0.2373	0.2131	0.2083	0.1841	0.1841	0.1792	0.1938	0.2083	0.2180	0.2277
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												75.6500
Effective ac	0.3688	0.3639	0.3591	0.3349	0.3300	0.3058	0.3058	0.3010	0.3155	0.3300	0.3397	0.3494

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	
Window (Uw = 1.20)			19.6300	1.1450	22.4771			(27)
External Wall	17.7100	2.4800	15.2300	0.1800	2.7414	140.0000	2132.2000	(29a)
Dormer Cheek	4.8100		4.8100	0.1800	0.8658	14.0000	67.3400	(29a)
Dormer Frontal Face	35.5800	17.1500	18.4300	0.1800	3.3174	14.0000	258.0200	(29a)
Flat HLR	44.9500		44.9500	0.1200	5.3940	9.0000	404.5500	(30)
Dormer Flat Roof	23.6000		23.6000	0.1200	2.8320	9.0000	212.4000	(30)
Total net area of external elements Aum(A, m2)			126.6500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		37.6277			(33)
Wall to Dwelling			50.2800	0.0000	0.0000	70.0000	3519.6000	(32)
Party Floor			64.7400			80.0000	5179.2000	(32d)
Internal Wall			48.1600			9.0000	433.4400	(32c)
Heat capacity Cm = Sum(A x k)					(28) ... (30) + (32) + (32a) ... (32e) =		12206.7500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							188.5504	(35)
Thermal bridges (Default value 0.150 * total exposed area)							18.9975	(36)
Total fabric heat loss						(33) + (36) =	56.6252	(37)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1120 (42)
Average daily hot water use (litres/day)												84.3601 (43)
Daily hot water use	Jan 92.7961	Feb 89.4217	Mar 86.0473	Apr 82.6729	May 79.2985	Jun 75.9241	Jul 75.9241	Aug 79.2985	Sep 82.6729	Oct 86.0473	Nov 89.4217	Dec 92.7961 (44)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

Energy conte	137.6139	120.3580	124.1987	108.2794	103.8967	89.6549	83.0785	95.3338	96.4724	112.4292	122.7253	133.2717 (45)
Energy content (annual)										Total = Sum (45)m =		1327.3126 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
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												
Solar input	116.9718	102.3043	105.5689	92.0375	88.3122	76.2067	70.6167	81.0337	82.0015	95.5649	104.3165	113.2810 (62)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
								Solar input (sum of months) = Sum (63)m =				0.0000 (63)
Output from w/h	116.9718	102.3043	105.5689	92.0375	88.3122	76.2067	70.6167	81.0337	82.0015	95.5649	104.3165	113.2810 (64)
								Total per year (kWh/year) = Sum (64)m =				1128.2157 (64)
Heat gains from water heating, kWh/month	29.2430	25.5761	26.3922	23.0094	22.0780	19.0517	17.6542	20.2584	20.5004	23.8912	26.0791	28.3202 (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	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	41.1707	36.5674	29.7386	22.5141	16.8295	14.2082	15.3525	19.9557	26.7845	34.0091	39.6936	42.3150 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	275.7075	278.5685	271.3589	256.0105	236.6360	218.4267	206.2617	203.4008	210.6103	225.9587	245.3332	263.5425 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840 (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)	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801 (71)
Water heating gains (Table 5)	39.3051	38.0596	35.4734	31.9575	29.6748	26.4607	23.7287	27.2291	28.4727	32.1118	36.2210	38.0648 (72)
Total internal gains	448.2073	445.2196	428.5950	402.5062	375.1644	351.1196	337.3670	342.6096	357.8917	384.1037	413.2719	435.9464 (73)

6. Solar gains

[Jan]													
				Area m2		Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d	Gains W

Southeast	19.6300				36.7938		0.7600		0.0000		0.7700		422.6683 (77)

Solar gains	422.6683	719.9604	985.0813	1220.5634	1367.1328	1357.2464	1308.5304	1199.1831	1066.6347	795.7097	506.2592	361.7160	(83)
Total gains	870.8756	1165.1801	1413.6763	1623.0696	1742.2972	1708.3660	1645.8974	1541.7927	1424.5264	1179.8134	919.5311	797.6624	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	43.8835	44.0380	44.1936	44.9885	45.1509	45.9809	45.9809	46.1506	45.6453	45.1509	44.8272	44.5082
alpha	3.9256	3.9359	3.9462	3.9992	4.0101	4.0654	4.0654	4.0767	4.0430	4.0101	3.9885	3.9672
util living area	0.9188	0.8213	0.6931	0.5359	0.3947	0.2752	0.1969	0.2189	0.3561	0.6130	0.8493	0.9362 (86)
MIT	20.2756	20.5530	20.7538	20.8756	20.9180	20.9310	20.9330	20.9329	20.9259	20.8547	20.5684	20.2162 (87)
Th 2	19.9252	19.9286	19.9319	19.9488	19.9521	19.9691	19.9691	19.9725	19.9623	19.9521	19.9454	19.9386 (88)
util rest of house	0.9034	0.7946	0.6572	0.4951	0.3520	0.2313	0.1509	0.1701	0.3039	0.5628	0.8209	0.9234 (89)
MIT 2	19.0005	19.3746	19.6324	19.7922	19.8408	19.8700	19.8714	19.8749	19.8593	19.7776	19.4191	18.9297 (90)
Living area fraction									fLA = Living area / (4) =			0.3732 (91)
MIT	19.4764	19.8143	20.0509	20.1965	20.2428	20.2659	20.2676	20.2697	20.2573	20.1796	19.8480	19.4098 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4764	19.8143	20.0509	20.1965	20.2428	20.2659	20.2676	20.2697	20.2573	20.1796	19.8480	19.4098 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.8959	0.7916	0.6614	0.5049	0.3640	0.2440	0.1642	0.1843	0.3189	0.5740	0.8181	0.9160 (94)
Useful gains	780.2386	922.3087	934.9781	819.4779	634.1224	416.7914	270.3095	284.0811	454.2454	677.2559	752.2384	730.6732 (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	1172.6397	1148.3482	1039.6943	851.4127	641.5488	417.8222	270.4559	284.3167	457.3990	719.4101	964.2702	1158.7277 (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	291.9464	151.8986	77.9089	22.9931	5.5253	0.0000	0.0000	0.0000	0.0000	31.3627	152.6629	318.4725 (98)
Space heating												1052.7703 (98)
Space heating per m2										(98) / (4) =		16.2615 (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)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1052.7703 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	291.9464	151.8986	77.9089	22.9931	5.5253	0.0000	0.0000	0.0000	0.0000	31.3627	152.6629	318.4725	(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)	291.9464	151.8986	77.9089	22.9931	5.5253	0.0000	0.0000	0.0000	0.0000	31.3627	152.6629	318.4725	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	116.9718	102.3043	105.5689	92.0375	88.3122	76.2067	70.6167	81.0337	82.0015	95.5649	104.3165	113.2810	(64)
Efficiency of water heater (217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(216)
Fuel for water heating, kWh/month	116.9718	102.3043	105.5689	92.0375	88.3122	76.2067	70.6167	81.0337	82.0015	95.5649	104.3165	113.2810	(219)
Water heating fuel used												1128.2157	(219)
Annual totals kWh/year													
Space heating fuel - main system												1052.7703	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 1.4125)													
mechanical ventilation fans (SFP = 1.4125)													292.2956 (230a)
Total electricity for the above, kWh/year													292.2956 (231)
Electricity for lighting (calculated in Appendix L)													290.8350 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.20 * 1080 * 1.00) =										-1036.3436		-1036.3436	(233)
Total delivered energy for all uses												1727.7729	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1052.7703	6.6100	69.5881 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1128.2157	6.6100	74.5751 (247)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Energy for lighting	290.8350	13.1900	38.3611 (250)
Additional standing charges			70.0000 (251)
Energy saving/generation technologies			
PV Unit	-1036.3436	13.1900	-136.6937 (252)
Total energy cost			115.8306 (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] =	0.4433 (257)
SAP value		93.8158
SAP rating (Section 12)		94 (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	1052.7703	0.5190	546.3878 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1128.2157	0.5190	585.5440 (264)
Space and water heating			1131.9317 (265)
Pumps and fans	292.2956	0.5190	151.7014 (267)
Energy for lighting	290.8350	0.5190	150.9433 (268)
Energy saving/generation technologies			
PV Unit	-1036.3436	0.5190	-537.8623 (269)
Total kg/year			896.7142 (272)
CO2 emissions per m2			13.8500 (273)
EI value			89.0505
EI rating			89 (274)
EI band			B

Calculation of stars for heating and DHW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

Main heating energy efficiency	$6.61 \times (1 + 0.29 \times 0.25) / 1.0000 = 7.089$, stars = 3
Main heating environmental impact	$0.519 \times (1 + 0.29 \times 0.25) / 1.0000 = 0.5566$, stars = 1
Water heating energy efficiency	$6.61 / 1.0000 = 6.610$, stars = 3
Water heating environmental impact	$0.519 / 1.0000 = 0.5190$, stars = 2

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	64.7400 (1b)	x 2.6200 (2b)	= 169.6188 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 169.6188 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					0.0000 / (5) = 0.0000 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.2500 (18)
					3 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.1938 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.8000	3.5000	3.6000	3.4000	3.4000	3.7000	3.5000	4.0000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9500	0.8750	0.9000	0.8500	0.8500	0.9250	0.8750	1.0000 (22a)
Adj infilt rate	0.2034	0.1938	0.1938	0.1792	0.1841	0.1695	0.1744	0.1647	0.1647	0.1792	0.1695	0.1938 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												75.6500 (23c)
Effective ac	0.3252	0.3155	0.3155	0.3010	0.3058	0.2913	0.2961	0.2864	0.2864	0.3010	0.2913	0.3155 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Window (Uw = 1.20)			19.6300	1.1450	22.4771		(27)
External Wall	17.7100	2.4800	15.2300	0.1800	2.7414	140.0000	2132.2000 (29a)
Dormer Cheek	4.8100		4.8100	0.1800	0.8658	14.0000	67.3400 (29a)
Dormer Frontal Face	35.5800	17.1500	18.4300	0.1800	3.3174	14.0000	258.0200 (29a)
Flat HLR	44.9500		44.9500	0.1200	5.3940	9.0000	404.5500 (30)
Dormer Flat Roof	23.6000		23.6000	0.1200	2.8320	9.0000	212.4000 (30)
Total net area of external elements Aum(A, m ²)			126.6500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	37.6277		(33)
Wall to Dwelling			50.2800	0.0000	0.0000	70.0000	3519.6000 (32)
Party Floor			64.7400			80.0000	5179.2000 (32d)
Internal Wall			48.1600			9.0000	433.4400 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 12206.7500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							188.5504 (35)
Thermal bridges (Default value 0.150 * total exposed area)							18.9975 (36)
Total fabric heat loss							(33) + (36) = 56.6252 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	18.2021	17.6599	17.6599	16.8465	17.1176	16.3042	16.5754	16.0331	16.0331	16.8465	16.3042	17.6599 (38)
Heat transfer coeff	74.8273	74.2851	74.2851	73.4717	73.7428	72.9294	73.2006	72.6583	72.6583	73.4717	72.9294	74.2851 (39)
Average = Sum(39)m / 12 =												73.5621 (39)
HLP	1.1558	1.1474	1.1474	1.1349	1.1391	1.1265	1.1307	1.1223	1.1223	1.1349	1.1265	1.1474 (40)
HLP (average)												1.1363 (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												2.1120 (42)
Average daily hot water use (litres/day)												84.3601 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	92.7961	89.4217	86.0473	82.6729	79.2985	75.9241	75.9241	79.2985	82.6729	86.0473	89.4217	92.7961 (44)



FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

Energy conte	137.6139	120.3580	124.1987	108.2794	103.8967	89.6549	83.0785	95.3338	96.4724	112.4292	122.7253	133.2717 (45)
Energy content (annual)										Total = Sum (45)m =		1327.3126 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
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	116.9718	102.3043	105.5689	92.0375	88.3122	76.2067	70.6167	81.0337	82.0015	95.5649	104.3165	113.2810 (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	116.9718	102.3043	105.5689	92.0375	88.3122	76.2067	70.6167	81.0337	82.0015	95.5649	104.3165	113.2810 (64)
Heat gains from water heating, kWh/month	29.2430	25.5761	26.3922	23.0094	22.0780	19.0517	17.6542	20.2584	20.5004	23.8912	26.0791	28.3202 (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	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	41.1707	36.5674	29.7386	22.5141	16.8295	14.2082	15.3525	19.9557	26.7845	34.0091	39.6936	42.3150 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	275.7075	278.5685	271.3589	256.0105	236.6360	218.4267	206.2617	203.4008	210.6103	225.9587	245.3332	263.5425 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840 (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)	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801 (71)
Water heating gains (Table 5)	39.3051	38.0596	35.4734	31.9575	29.6748	26.4607	23.7287	27.2291	28.4727	32.1118	36.2210	38.0648 (72)
Total internal gains	448.2073	445.2196	428.5950	402.5062	375.1644	351.1196	337.3670	342.6096	357.8917	384.1037	413.2719	435.9464 (73)

6. Solar gains

[Jan]													
	Area m2				Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
Southeast	19.6300				41.7137		0.7600		0.0000		0.7700		479.1849 (77)
Solar gains	479.1849	710.6295	981.9314	1259.0738	1370.0142	1458.1619	1389.7860	1290.7377	1140.3671	861.8539	554.3509	393.1141 (83)	
Total gains	927.3922	1155.8491	1410.5264	1661.5799	1745.1786	1809.2816	1727.1530	1633.3473	1498.2588	1245.9576	967.6229	829.0605 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	45.3145	45.6453	45.6453	46.1506	45.9809	46.4938	46.3216	46.6673	46.6673	46.1506	46.4938	45.6453
alpha	4.0210	4.0430	4.0430	4.0767	4.0654	4.0996	4.0881	4.1112	4.1112	4.0767	4.0996	4.0430
util living area	0.8847	0.7949	0.6444	0.4650	0.3231	0.1853	0.1102	0.1245	0.2659	0.5161	0.7924	0.9129 (86)
MIT	20.4448	20.6388	20.8162	20.9054	20.9280	20.9336	20.9338	20.9341	20.9324	20.8990	20.6978	20.3698 (87)
Th 2	19.9555	19.9623	19.9623	19.9725	19.9691	19.9793	19.9759	19.9827	19.9827	19.9725	19.9793	19.9623 (88)
util rest of house	0.8640	0.7654	0.6058	0.4240	0.2806	0.1442	0.0668	0.0793	0.2171	0.4636	0.7571	0.8958 (89)
MIT 2	19.2587	19.5183	19.7379	19.8484	19.8675	19.8824	19.8789	19.8862	19.8853	19.8446	19.6167	19.1639 (90)
Living area fraction									fLA = Living area / (4) =			0.3732 (91)
MIT	19.7013	19.9365	20.1403	20.2428	20.2633	20.2747	20.2726	20.2773	20.2761	20.2381	20.0201	19.6139 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7013	19.9365	20.1403	20.2428	20.2633	20.2747	20.2726	20.2773	20.2761	20.2381	20.0201	19.6139 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.8583	0.7646	0.6126	0.4349	0.2928	0.1561	0.0794	0.0924	0.2312	0.4775	0.7586	0.8893 (94)
Ext temp.	795.9897	883.7355	864.1195	722.6287	510.9794	282.4626	137.0692	150.9252	346.3685	594.8967	734.0866	737.2724 (95)
Heat loss rate W	5.2000	5.7000	7.6000	10.2000	13.3000	16.4000	18.4000	18.2000	15.5000	11.9000	8.1000	5.2000 (96)
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	215.0953	116.8073	50.1744	10.9701	1.8693	0.0000	0.0000	0.0000	0.0000	13.1814	97.3733	248.0987 (98)
Space heating per m2												753.5698 (98)
										(98) / (4) =		11.6399 (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)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													753.5698 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	215.0953	116.8073	50.1744	10.9701	1.8693	0.0000	0.0000	0.0000	0.0000	13.1814	97.3733	248.0987	(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)	215.0953	116.8073	50.1744	10.9701	1.8693	0.0000	0.0000	0.0000	0.0000	13.1814	97.3733	248.0987	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	116.9718	102.3043	105.5689	92.0375	88.3122	76.2067	70.6167	81.0337	82.0015	95.5649	104.3165	113.2810	(64)
Efficiency of water heater (217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(216)
Fuel for water heating, kWh/month	116.9718	102.3043	105.5689	92.0375	88.3122	76.2067	70.6167	81.0337	82.0015	95.5649	104.3165	113.2810	(219)
Water heating fuel used												1128.2157	(219)
Annual totals kWh/year													
Space heating fuel - main system												753.5698	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 1.4125)													
mechanical ventilation fans (SFP = 1.4125)													292.2956 (230a)
Total electricity for the above, kWh/year													292.2956 (231)
Electricity for lighting (calculated in Appendix L)													290.8350 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.20 * 1151 * 1.00) =										-1105.3291		-1105.3291	(233)
Total delivered energy for all uses												1359.5870	(238)

10a. Fuel costs - using BEDF prices (483)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	753.5698	12.2200	92.0862 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1128.2157	12.2200	137.8680 (247)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Energy for lighting	290.8350	19.1200	55.6076 (250)
Additional standing charges			9.0000 (251)
Energy saving/generation technologies			
PV Unit	-1105.3291	19.1200	-211.3389 (252)
Total energy cost			83.2229 (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	753.5698	0.5190	391.1027 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1128.2157	0.5190	585.5440 (264)
Space and water heating			976.6467 (265)
Pumps and fans	292.2956	0.5190	151.7014 (267)
Energy for lighting	290.8350	0.5190	150.9433 (268)
Energy saving/generation technologies			
PV Unit	-1105.3291	0.5190	-573.6658 (269)
Total kg/year			705.6257 (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	753.5698	3.0700	2313.4592 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1128.2157	3.0700	3463.6223 (264)
Space and water heating			5777.0815 (265)
Pumps and fans	292.2956	3.0700	897.3475 (267)
Energy for lighting	290.8350	3.0700	892.8633 (268)
Energy saving/generation technologies			
PV Unit	-1105.3291	3.0700	-3393.3602 (269)
Primary energy kWh/year			4173.9321 (272)
Primary energy kWh/m2/year			64.4722 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: A 94
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	Recommended
O	Not considered
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U Solar photovoltaic panels	Already installed
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
N Solar water heating	+ 2.1	-£ 78	-345 kg (48.8%)

Recommended measures	Typical annual savings		Energy efficiency	Environmental impact
Solar water heating	£78	5.32 kg/m²	A 96	A 93
Total Savings	£78	5.32 kg/m²		

Potential energy efficiency rating: A 96
Potential environmental impact rating: A 93

Fuel prices for cost data on this page from database revision number 483 TEST (30 Sep 2021)
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	£295	£217	£78
Space heating	£101	£101	£0
Water heating	£138	£60	£78
Lighting	£56	£56	£0
Generated (PV)	-£211	-£211	£0
Total cost of fuels	£84	£6	£78
Total cost of uses	£84	£6	£78
Delivered energy	21 kWh/m²	11 kWh/m²	10 kWh/m²
Carbon dioxide emissions	0.7 tonnes	0.4 tonnes	0.3 tonnes
CO2 emissions per m²	11 kg/m²	6 kg/m²	5 kg/m²
Primary energy	64 kWh/m²	33 kWh/m²	31 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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	64.7400 (1b)	x 2.6200 (2b)	= 169.6188 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 169.6188 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.2500 (18)
Number of sides sheltered					3 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.1938 (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	0.2470	0.2422	0.2373	0.2131	0.2083	0.1841	0.1841	0.1792	0.1938	0.2083	0.2180	0.2277 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												75.6500 (23c)
Effective ac	0.3688	0.3639	0.3591	0.3349	0.3300	0.3058	0.3058	0.3010	0.3155	0.3300	0.3397	0.3494 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Window (Uw = 1.20)			19.6300	1.1450	22.4771		(27)
External Wall	17.7100	2.4800	15.2300	0.1800	2.7414	140.0000	2132.2000 (29a)
Dormer Cheek	4.8100		4.8100	0.1800	0.8658	14.0000	67.3400 (29a)
Dormer Frontal Face	35.5800	17.1500	18.4300	0.1800	3.3174	14.0000	258.0200 (29a)
Flat HLR	44.9500		44.9500	0.1200	5.3940	9.0000	404.5500 (30)
Dormer Flat Roof	23.6000		23.6000	0.1200	2.8320	9.0000	212.4000 (30)
Total net area of external elements Aum(A, m ²)			126.6500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	37.6277		(33)
Wall to Dwelling			50.2800	0.0000	0.0000	70.0000	3519.6000 (32)
Party Floor			64.7400			80.0000	5179.2000 (32d)
Internal Wall			48.1600			9.0000	433.4400 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	12206.7500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							188.5504 (35)
Thermal bridges (Default value 0.150 * total exposed area)							18.9975 (36)
Total fabric heat loss						(33) + (36) =	56.6252 (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	20.6422	20.3711	20.1000	18.7444	18.4732	17.1176	17.1176	16.8465	17.6599	18.4732	19.0155	19.5577 (38)
Heat transfer coeff	77.2674	76.9963	76.7252	75.3696	75.0984	73.7428	73.7428	73.4717	74.2851	75.0984	75.6407	76.1829 (39)
Average = Sum(39)m / 12 =												75.3018 (39)
HLP	1.1935	1.1893	1.1851	1.1642	1.1600	1.1391	1.1391	1.1349	1.1474	1.1600	1.1684	1.1768 (40)
HLP (average)												1.1631 (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												2.1120 (42)
Average daily hot water use (litres/day)												84.3601 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	92.7961	89.4217	86.0473	82.6729	79.2985	75.9241	75.9241	79.2985	82.6729	86.0473	89.4217	92.7961 (44)



FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Energy content (annual)	137.6139	120.3580	124.1987	108.2794	103.8967	89.6549	83.0785	95.3338	96.4724	112.4292	122.7253	133.2717 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1327.3126 (45)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
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	116.9718	102.3043	105.5689	92.0375	88.3122	76.2067	70.6167	81.0337	82.0015	95.5649	104.3165	113.2810 (62)
Aperture area of solar collector												3.0000 (H1)
Zero-loss collector efficiency												0.7000 (H2)
Collector heat loss coefficient												1.8000 (H3)
Collector 2nd order heat loss coefficient												0.0050 (H3a)
Collector effective heat loss coefficient												1.8063 (H3b)
Collector performance ratio												2.5804 (H4)
Annual solar radiation per m2												1079.5246 (H5)
Overshading factor												0.8000 (H6)
Solar energy available												1813.6014 (H7)
Adjustment factor for showers												1.0000 (H7a)
Solar-to-load ratio												1.3664 (H8)
Utilisation factor												0.5190 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												84.3601 (H14)
Volume ratio Veff/V												0.8890 (H15)
Solar storage volume factor												0.9765 (H16)
Solar input												-808.1590 (H17)
Solar input	-23.4350	-39.1063	-66.6025	-89.2604	-110.2738	-108.4167	-106.9839	-93.4724	-73.2076	-49.9922	-27.7973	-19.6111 (63)
Solar input (sum of months) = Sum (63)m =												-808.1590 (63)
Output from w/h	93.5368	63.1980	38.9664	2.7771	0.0000	0.0000	0.0000	0.0000	8.7939	45.5727	76.5192	93.6699 (64)
Total per year (kWh/year) = Sum (64)m =												423.0340 (64)
Heat gains from water heating, kWh/month	29.2430	25.5761	26.3922	23.0094	22.0780	19.0517	17.6542	20.2584	20.5004	23.8912	26.0791	28.3202 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	41.1707	36.5674	29.7386	22.5141	16.8295	14.2082	15.3525	19.9557	26.7845	34.0091	39.6936	42.3150 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	275.7075	278.5685	271.3589	256.0105	236.6360	218.4267	206.2617	203.4008	210.6103	225.9587	245.3332	263.5425 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840 (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)	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801 (71)
Water heating gains (Table 5)	39.3051	38.0596	35.4734	31.9575	29.6748	26.4607	23.7287	27.2291	28.4727	32.1118	36.2210	38.0648 (72)
Total internal gains	448.2073	445.2196	428.5950	402.5062	375.1644	351.1196	337.3670	342.6096	357.8917	384.1037	413.2719	435.9464 (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							
Southeast	19.6300	36.7938	0.7600	0.0000	0.7700	422.6683 (77)						
Solar gains	422.6683	719.9604	985.0813	1220.5634	1367.1328	1357.2464	1308.5304	1199.1831	1066.6347	795.7097	506.2592	361.7160 (83)
Total gains	870.8756	1165.1801	1413.6763	1623.0696	1742.2972	1708.3660	1645.8974	1541.7927	1424.5264	1179.8134	919.5311	797.6624 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.8835	44.0380	44.1936	44.9885	45.1509	45.9809	45.9809	46.1506	45.6453	45.1509	44.8272	44.5082
alpha	3.9256	3.9359	3.9462	3.9992	4.0101	4.0654	4.0654	4.0767	4.0430	4.0101	3.9885	3.9672
util living area	0.9188	0.8213	0.6931	0.5359	0.3947	0.2752	0.1969	0.2189	0.3561	0.6130	0.8493	0.9362 (86)
MIT	20.2756	20.5530	20.7538	20.8756	20.9180	20.9310	20.9330	20.9329	20.9259	20.8547	20.5684	20.2162 (87)
Th 2	19.9252	19.9286	19.9319	19.9488	19.9521	19.9691	19.9691	19.9725	19.9623	19.9521	19.9454	19.9386 (88)
util rest of house	0.9034	0.7946	0.6572	0.4951	0.3520	0.2313	0.1509	0.1701	0.3039	0.5628	0.8209	0.9234 (89)
MIT 2	19.0005	19.3746	19.6324	19.7922	19.8408	19.8700	19.8714	19.8749	19.8593	19.7776	19.4191	18.9297 (90)
Living area fraction									fLA = Living area / (4) =			0.3732 (91)
MIT	19.4764	19.8143	20.0509	20.1965	20.2428	20.2659	20.2676	20.2697	20.2573	20.1796	19.8480	19.4098 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4764	19.8143	20.0509	20.1965	20.2428	20.2659	20.2676	20.2697	20.2573	20.1796	19.8480	19.4098 (93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8959	0.7916	0.6614	0.5049	0.3640	0.2440	0.1642	0.1843	0.3189	0.5740	0.8181	0.9160	(94)
Useful gains	780.2386	922.3087	934.9781	819.4779	634.1224	416.7914	270.3095	284.0811	454.2454	677.2559	752.2384	730.6732	(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	1172.6397	1148.3482	1039.6943	851.4127	641.5488	417.8222	270.4559	284.3167	457.3990	719.4101	964.2702	1158.7277	(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	291.9464	151.8986	77.9089	22.9931	5.5253	0.0000	0.0000	0.0000	0.0000	31.3627	152.6629	318.4725	(98)
Space heating												1052.7703	(98)
Space heating per m2												16.2615	(99)
												(98) / (4) =	

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1052.7703 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	291.9464	151.8986	77.9089	22.9931	5.5253	0.0000	0.0000	0.0000	0.0000	31.3627	152.6629	318.4725	(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)	291.9464	151.8986	77.9089	22.9931	5.5253	0.0000	0.0000	0.0000	0.0000	31.3627	152.6629	318.4725	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	93.5368	63.1980	38.9664	2.7771	0.0000	0.0000	0.0000	0.0000	8.7939	45.5727	76.5192	93.6699	(64)
Efficiency of water heater													100.0000 (216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month	93.5368	63.1980	38.9664	2.7771	0.0000	0.0000	0.0000	0.0000	8.7939	45.5727	76.5192	93.6699	(219)
Water heating fuel used												423.0340	(219)
Annual totals kWh/year													
Space heating fuel - main system												1052.7703	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 1.4125)													
mechanical ventilation fans (SFP = 1.4125)													292.2956 (230a)
pump for solar water heating													50.0000 (230g)
Total electricity for the above, kWh/year													342.2956 (231)
Electricity for lighting (calculated in Appendix L)													290.8350 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.20 * 1080 * 1.00) =										-1036.3436		-1036.3436	(233)
Total delivered energy for all uses												1072.5913	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1052.7703	6.6100	69.5881	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	423.0340	6.6100	27.9626	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Pump for solar water heating	50.0000	13.1900	6.5950	(249)
Energy for lighting	290.8350	13.1900	38.3611	(250)
Additional standing charges			70.0000	(251)
Energy saving/generation technologies				
PV Unit	-1036.3436	13.1900	-136.6937	(252)
Total energy cost			75.8131	(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] =	0.2902 (257)
SAP value			95.9524
SAP rating (Section 12)			96 (258)
SAP band			A

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

Energy	Emission factor	Emissions
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FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

	kWh/year	kg CO2/kWh	kg CO2/year	
Space heating - main system 1	1052.7703	0.5190	546.3878	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	423.0340	0.5190	219.5547	(264)
Space and water heating			765.9424	(265)
Pumps and fans	342.2956	0.5190	177.6514	(267)
Energy for lighting	290.8350	0.5190	150.9433	(268)
Energy saving/generation technologies				
PV Unit	-1036.3436	0.5190	-537.8623	(269)
Total kg/year			556.6749	(272)
CO2 emissions per m2			8.6000	(273)
EI value			93.2026	
EI rating			93	(274)
EI band			A	

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	64.7400 (1b)	x 2.6200 (2b)	= 169.6188 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 169.6188 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.2500 (18)
Number of sides sheltered					3 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.1938 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.8000	3.5000	3.6000	3.4000	3.4000	3.7000	3.5000	4.0000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9500	0.8750	0.9000	0.8500	0.8500	0.9250	0.8750	1.0000 (22a)
Adj infilt rate	0.2034	0.1938	0.1938	0.1792	0.1841	0.1695	0.1744	0.1647	0.1647	0.1792	0.1695	0.1938 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												75.6500 (23c)
Effective ac	0.3252	0.3155	0.3155	0.3010	0.3058	0.2913	0.2961	0.2864	0.2864	0.3010	0.2913	0.3155 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Window (Uw = 1.20)			19.6300	1.1450	22.4771		(27)
External Wall	17.7100	2.4800	15.2300	0.1800	2.7414	140.0000	2132.2000 (29a)
Dormer Cheek	4.8100		4.8100	0.1800	0.8658	14.0000	67.3400 (29a)
Dormer Frontal Face	35.5800	17.1500	18.4300	0.1800	3.3174	14.0000	258.0200 (29a)
Flat HLR	44.9500		44.9500	0.1200	5.3940	9.0000	404.5500 (30)
Dormer Flat Roof	23.6000		23.6000	0.1200	2.8320	9.0000	212.4000 (30)
Total net area of external elements Aum(A, m ²)			126.6500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	37.6277		(33)
Wall to Dwelling			50.2800	0.0000	0.0000	70.0000	3519.6000 (32)
Party Floor			64.7400			80.0000	5179.2000 (32d)
Internal Wall			48.1600			9.0000	433.4400 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	12206.7500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							188.5504 (35)
Thermal bridges (Default value 0.150 * total exposed area)							18.9975 (36)
Total fabric heat loss						(33) + (36) =	56.6252 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	18.2021	17.6599	17.6599	16.8465	17.1176	16.3042	16.5754	16.0331	16.0331	16.8465	16.3042	17.6599 (38)
Heat transfer coeff	74.8273	74.2851	74.2851	73.4717	73.7428	72.9294	73.2006	72.6583	72.6583	73.4717	72.9294	74.2851 (39)
Average = Sum(39)m / 12 =												73.5621 (39)
HLP	1.1558	1.1474	1.1474	1.1349	1.1391	1.1265	1.1307	1.1223	1.1223	1.1349	1.1265	1.1474 (40)
HLP (average)												1.1363 (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												2.1120 (42)
Average daily hot water use (litres/day)												84.3601 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	92.7961	89.4217	86.0473	82.6729	79.2985	75.9241	75.9241	79.2985	82.6729	86.0473	89.4217	92.7961 (44)



FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

Energy content (annual)	137.6139	120.3580	124.1987	108.2794	103.8967	89.6549	83.0785	95.3338	96.4724	112.4292	122.7253	133.2717 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1327.3126 (45)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
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	116.9718	102.3043	105.5689	92.0375	88.3122	76.2067	70.6167	81.0337	82.0015	95.5649	104.3165	113.2810 (62)
Aperture area of solar collector												3.0000 (H1)
Zero-loss collector efficiency												0.7000 (H2)
Collector heat loss coefficient												1.8000 (H3)
Collector 2nd order heat loss coefficient												0.0050 (H3a)
Collector effective heat loss coefficient												1.8063 (H3b)
Collector performance ratio												2.5804 (H4)
Annual solar radiation per m2												1151.3844 (H5)
Overshading factor												0.8000 (H6)
Solar energy available												1934.3259 (H7)
Adjustment factor for showers												1.0000 (H7a)
Solar-to-load ratio												1.4573 (H8)
Utilisation factor												0.4965 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												84.3601 (H14)
Volume ratio Veff/V												0.8890 (H15)
Solar storage volume factor												0.9765 (H16)
Solar input												-824.6185 (H17)
Solar input	-25.9312	-37.7218	-64.8407	-89.5438	-106.9299	-112.4351	-109.7994	-97.6372	-76.3421	-52.9248	-29.7220	-20.7906 (63)
Solar input (sum of months) = Sum (63)m =												-824.6185 (63)
Output from w/h	91.0407	64.5825	40.7282	2.4938	0.0000	0.0000	0.0000	0.0000	5.6594	42.6400	74.5945	92.4904 (64)
Total per year (kWh/year) = Sum (64)m =												414.2295 (64)
Heat gains from water heating, kWh/month	29.2430	25.5761	26.3922	23.0094	22.0780	19.0517	17.6542	20.2584	20.5004	23.8912	26.0791	28.3202 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	41.1707	36.5674	29.7386	22.5141	16.8295	14.2082	15.3525	19.9557	26.7845	34.0091	39.6936	42.3150 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	275.7075	278.5685	271.3589	256.0105	236.6360	218.4267	206.2617	203.4008	210.6103	225.9587	245.3332	263.5425 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840 (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)	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801 (71)
Water heating gains (Table 5)	39.3051	38.0596	35.4734	31.9575	29.6748	26.4607	23.7287	27.2291	28.4727	32.1118	36.2210	38.0648 (72)
Total internal gains	448.2073	445.2196	428.5950	402.5062	375.1644	351.1196	337.3670	342.6096	357.8917	384.1037	413.2719	435.9464 (73)

6. Solar gains

[Jan]												
Area	19.6300											
Solar flux	41.7137											
Specific data	0.7600											
FF	0.0000											
Access factor	0.7700											
Gains	479.1849											479.1849 (77)
Solar gains	479.1849	710.6295	981.9314	1259.0738	1370.0142	1458.1619	1389.7860	1290.7377	1140.3671	961.8539	554.3509	393.1141 (83)
Total gains	927.3922	1155.8491	1410.5264	1661.5799	1745.1786	1809.2816	1727.1530	1633.3473	1498.2588	1245.9576	967.6229	829.0605 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
Jan	45.3145	45.6453	45.6453	46.1506	45.9809	46.4938	46.3216	46.6673	46.6673	46.1506	46.4938	45.6453
alpha	4.0210	4.0430	4.0430	4.0767	4.0654	4.0996	4.0881	4.1112	4.1112	4.0767	4.0996	4.0430
util living area	0.8847	0.7949	0.6444	0.4650	0.3231	0.1853	0.1102	0.1245	0.2659	0.5161	0.7924	0.9129 (86)
MIT	20.4448	20.6388	20.8162	20.9054	20.9280	20.9336	20.9338	20.9341	20.9324	20.8990	20.6978	20.3698 (87)
Th 2	19.9555	19.9623	19.9623	19.9725	19.9691	19.9793	19.9759	19.9827	19.9827	19.9725	19.9793	19.9623 (88)
util rest of house	0.8640	0.7654	0.6058	0.4240	0.2806	0.1442	0.0668	0.0793	0.2171	0.4636	0.7571	0.8958 (89)
MIT 2	19.2587	19.5183	19.7379	19.8484	19.8675	19.8824	19.8789	19.8862	19.8853	19.8446	19.6167	19.1639 (90)
Living area fraction									fLA = Living area / (4) =			0.3732 (91)
MIT	19.7013	19.9365	20.1403	20.2428	20.2633	20.2747	20.2726	20.2773	20.2761	20.2381	20.0201	19.6139 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7013	19.9365	20.1403	20.2428	20.2633	20.2747	20.2726	20.2773	20.2761	20.2381	20.0201	19.6139 (93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8583	0.7646	0.6126	0.4349	0.2928	0.1561	0.0794	0.0924	0.2312	0.4775	0.7586	0.8893	(94)
Useful gains	795.9897	883.7355	864.1195	722.6287	510.9794	282.4626	137.0692	150.9252	346.3685	594.8967	734.0866	737.2724	(95)
Ext temp.	5.2000	5.7000	7.6000	10.2000	13.3000	16.4000	18.4000	18.2000	15.5000	11.9000	8.1000	5.2000	(96)
Heat loss rate W													
Month fracti	1085.0963	1057.5559	931.5582	737.8649	513.4919	282.5805	137.0732	150.9329	347.0211	612.6136	869.3273	1070.7383	(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	215.0953	116.8073	50.1744	10.9701	1.8693	0.0000	0.0000	0.0000	0.0000	13.1814	97.3733	248.0987	(98)
Space heating per m2												753.5698	(98)
											(98) / (4) =	11.6399	(99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													753.5698 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	215.0953	116.8073	50.1744	10.9701	1.8693	0.0000	0.0000	0.0000	0.0000	13.1814	97.3733	248.0987	(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)	215.0953	116.8073	50.1744	10.9701	1.8693	0.0000	0.0000	0.0000	0.0000	13.1814	97.3733	248.0987	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	91.0407	64.5825	40.7282	2.4938	0.0000	0.0000	0.0000	0.0000	5.6594	42.6400	74.5945	92.4904	(64)
Efficiency of water heater	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month	91.0407	64.5825	40.7282	2.4938	0.0000	0.0000	0.0000	0.0000	5.6594	42.6400	74.5945	92.4904	(219)
Water heating fuel used													
Annual totals kWh/year													414.2295 (219)
Space heating fuel - main system													753.5698 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 1.4125)													
mechanical ventilation fans (SFP = 1.4125)													292.2956 (230a)
pump for solar water heating													50.0000 (230g)
Total electricity for the above, kWh/year													342.2956 (231)
Electricity for lighting (calculated in Appendix L)													290.8350 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.20 * 1151 * 1.00) =									-1105.3291			-1105.3291	(233)
Total delivered energy for all uses													695.6008 (238)

10a. Fuel costs - using BEDF prices (483)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	753.5698	12.2200	92.0862 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	414.2295	12.2200	50.6188 (247)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Pump for solar water heating	50.0000	19.1200	9.5600 (249)
Energy for lighting	290.8350	19.1200	55.6076 (250)
Additional standing charges			9.0000 (251)
Energy saving/generation technologies			
PV Unit	-1105.3291	19.1200	-211.3389 (252)
Total energy cost			5.5338 (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	753.5698	0.5190	391.1027 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	414.2295	0.5190	214.9851 (264)
Space and water heating			606.0878 (265)
Pumps and fans	342.2956	0.5190	177.6514 (267)
Energy for lighting	290.8350	0.5190	150.9433 (268)
Energy saving/generation technologies			
PV Unit	-1105.3291	0.5190	-573.6658 (269)
Total kg/year			361.0168 (272)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

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	753.5698	3.0700	2313.4592	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	414.2295	3.0700	1271.6846	(264)
Space and water heating			3585.1438	(265)
Pumps and fans	342.2956	3.0700	1050.8475	(267)
Energy for lighting	290.8350	3.0700	892.8633	(268)
Energy saving/generation technologies				
PV Unit	-1105.3291	3.0700	-3393.3602	(269)
Primary energy kWh/year			2135.4944	(272)
Primary energy kWh/m2/year			32.9857	(273)

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Designed)



Property Reference	210926				Issued on Date	20/10/2021
Assessment Reference	APARTMENT 3.02			Prop Type Ref	APARTMENT 3.02	
Property	UB7 7QR					
SAP Rating	94 A	DER	16.03	TER	25.05	
Environmental	89 B	% DER<TER	36.01			
CO ₂ Emissions (t/year)	0.71	DFEE	38.41	TFEE	43.48	
General Requirements Compliance	Pass	% DFEE<TFEE	11.66			
Assessor Details	Mr. Dion Mellows, SHA Environmental Limited, Tel: 02036370427, info@shaenvironmental.co.uk				Assessor ID	G297-0001
Client						

SUMMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Electricity		
Fuel factor	1.55 (electricity)		
Target Carbon Dioxide Emission Rate (TER)	25.05	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	16.03	kgCO ₂ /m ²	Pass
	-9.02 (-36.0%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	43.48	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	38.41	kWh/m ² /yr	
	-5.1 (-11.7%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Roof	0.12 (max. 0.20)	0.12 (max. 0.35)	Pass
Openings	1.20 (max. 2.00)	1.20 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated using default γ -value of 0.15

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system	Electric underfloor heating - Electric Underfloor heating in thin screed (standard tariff)	
Secondary heating system	None	

5 Cylinder insulation

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Designed)



Hot water storage

No cylinder

6 Controls

Space heating controls

Time and temperature zone control

Pass

Hot water controls

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100

%

Minimum

75

%

Pass

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power

1.13

Maximum

1.5

Pass

MVHR efficiency

89

%

Minimum

70

%

Pass

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)

Medium

Pass

Based on:

Overshading

Average

Windows facing South East

19.63 m², No overhang

Air change rate

6.00 ach

Blinds/curtains

Dark-coloured curtain or roller blind, closed 50% of daylight hours

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

5.00 (design value)

Maximum

10.0

Pass

10 Key features

Party wall U-value

0.00

W/m²K

Roof U-value

0.12

W/m²K

Roof U-value

0.12

W/m²K

Photovoltaic array

1.20

kW

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)



Property Reference	210926	Issued on Date	20/10/2021
Assessment Reference	APARTMENT 3.02	Prop Type Ref	APARTMENT 3.02
Property	UB7 7QR		
SAP Rating	94 A	DER	16.03
Environmental	89 B	TER	25.05
CO ₂ Emissions (t/year)	0.71	% DER<TER	36.01
General Requirements Compliance	Pass	DFEE	38.41
		TFEE	43.48
		% DFEE<TFEE	11.66
Assessor Details	Mr. Dion Mellows, SHA Environmental Limited, Tel: 02036370427, info@shaenvironmental.co.uk		Assessor ID
			G297-0001
Client			

SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

Orientation	North West
Property Tenure	Unknown
Transaction Type	None of the above
Terrain Type	Urban
1.0 Property Type	House, Semi-Detached
2.0 Number of Storeys	1
3.0 Date Built	2021
4.0 Sheltered Sides	3
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements			
	Ground Floor:	Heat Loss Perimeter 19.88 m	Internal Floor Area 64.74 m ²
			Average Storey Height 2.62 m
7.0 Living Area	24.16	m ²	
8.0 Thermal Mass Parameter	Precise calculation		
Thermal Mass	188.55	kJ/m ² K	

9.0 External Walls						
Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
External Wall	Cavity Wall	Cavity wall; dense plaster, lightweight aggregate block, filled cavity, any outside structure	0.18	140.00	17.71	15.23
Dormer Cheek	Steel Frame	Steel frame wall (warm frame or hybrid construction)	0.18	14.00	4.81	4.81
Dormer Frontal Face	Steel Frame	Steel frame wall (warm frame or hybrid construction)	0.18	14.00	35.58	18.43

9.1 Party Walls						
Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)	
Wall to Dwelling	Filled Cavity with Edge Sealing	Single plasterboard on dabs on both sides, dense blocks, cavity or cavity fill	0.00	70.00	50.28	

9.2 Internal Walls						
Description	Construction			Kappa (kJ/m ² K)	Area (m ²)	
Internal Wall	Plasterboard on timber frame			9.00	48.16	

10.0 External Roofs

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)



Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area (m²)	Nett Area (m²)
Flat HLR	External Flat Roof	Plasterboard, insulated flat roof	0.12	9.00	44.95	44.95
Dormer Flat Roof	External Flat Roof	Plasterboard, insulated flat roof	0.12	9.00	23.60	23.60

11.1 Party Floors

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor	Concrete floor slab, carpeted	80.00	64.74

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Window	BFRC data	Window	Double glazed			0.76			1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
SE1	Window	[1] External Wall	South East	Dark-coloured curtain or roller blind	0.00					2.48	50
SE2	Window	[3] Dormer Frontal Face	South East	Dark-coloured curtain or roller blind	0.00					6.00	50
SE3	Window	[3] Dormer Frontal Face	South East	Dark-coloured curtain or roller blind	0.00					2.15	50
SE4	Window	[3] Dormer Frontal Face	South East	Dark-coloured curtain or roller blind	0.00					4.50	50
SE5	Window	[3] Dormer Frontal Face	South East	Dark-coloured curtain or roller blind	0.00					4.50	50

14.0 Conservatory

15.0 Draught Proofing

%

16.0 Draught Lobby

17.0 Thermal Bridging

Y-value

W/m²K

18.0 Pressure Testing

Designed AP₅₀

m³/(h.m²) @ 50 Pa

Property Tested ?

As Built AP₅₀

m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather

Cross ventilation possible

Night Ventilation

Air change rate

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)



Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500029
Configuration	2
MVHR Duct Insulated	Yes
Manufacturer SFP	1.13
Duct Type	Rigid
MVHR Efficiency	89.00
Wet Rooms	2

20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				0
Number of passive vents				0
Number of flueless gas fires				0

21.0 Fixed Cooling System

No

22.0 Lighting

Internal

Total number of light fittings	25	
Total number of L.E.L. fittings	25	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted	No
------------------------	----

23.0 Electricity Tariff

24 Hour

24.0 Main Heating 1

Description	SAP table	
Percentage of Heat	Underfloor Electric Heating	
Main Heating	100	%
SAP Code	SEH	
Efficiency (SAP Table)	424	
Controls	100.0	%
Sap Code	CMD Time and temperature zone control	
	2706	

25.0 Main Heating 2

None

Community Heating	None
-------------------	------

28.0 Water Heating

Water Heating	HES Instantaneous at point of use
Flue Gas Heat Recovery System	Independent
Waste Water Heat Recovery	No
Instantaneous System 1	No

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)



Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
SAP Code	909

29.0 Hot Water Cylinder

32.0 Photovoltaic Unit

PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
1.20	South	30°	None Or Little	Yes

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

	Typical Cost	Typical savings per year	Ratings after improvement	
			SAP rating	Environmental Impact
Solar water heating	£4,000 - £6,000	£78	A 96	

BLOCK COMPLIANCE

Calculation Type: New Build (As Designed)



Block Reference	000122	Issued on Date	20/10/2021
Block Name	Proposed Case		
Assessor Details	Mr. Dion Mellows, SHA Environmental Limited, Tel: 02036370427, info@shaenvironmental.co.uk		Assessor ID
			G297-0001
Client			

Block Compliance Report - DER

Block Reference: 000122		Block Name: Proposed Case			
Property-Assessment Reference	Multiplier	Floor Area (m ²)	DER (kgCO ₂ /m ²)	TER (kgCO ₂ /m ²)	% DER/TER
210925-APARTMENT 3.01	1	64.74	16.03	25.05	36.01 %
210926-APARTMENT 3.02	1	64.74	16.03	25.05	36.01 %
210927-APARTMENT 3.03	1	64.74	17.43	28.29	38.40 %
210928-APARTMENT 3.04	1	64.74	17.43	28.29	38.40 %
Totals:	4	258.96	66.92	106.69	
Average DER = 16.73 kgCO ₂ /m ²		% DER/TER	PASS		
Average TER = 26.67 kgCO ₂ /m ²		37.27 %			

Block Compliance Report - DFEE

Block Reference: 000122		Block Name: Proposed Case			
Property-Assessment Reference	Multiplier	Floor Area (m ²)	DFEE (kWh/m ² /yr)	TFEE (kWh/m ² /yr)	% DFEE/TFEE
210925-APARTMENT 3.01	1	64.74	38.41	43.48	11.66 %
210926-APARTMENT 3.02	1	64.74	38.41	43.48	11.66 %
210927-APARTMENT 3.03	1	64.74	51.63	54.21	4.76 %
210928-APARTMENT 3.04	1	64.74	51.63	54.21	4.76 %
Totals:	4	258.96	180.08	195.39	
Average DFEE = 45.02 kWh/m ² /yr		% DFEE/TFEE	PASS		
Average TFEE = 48.85 kWh/m ² /yr		7.84 %			

DWELLING SIGN OFF REPORT



Section 1: Dwelling Information

Dwelling Address (Please confirm final postal address and post code of the dwelling.)

House Name		
House Number		
Postcode	UB7 7QR	
Street		
Locality		
Town		
County		

Dwelling Orientation North West (Please confirm orientation of main entrance door of the dwelling.)

Comments

Terrain Type Urban

Property Type House, Semi-Detached

Comments

Overshading (called Sunlight/shade in assessment) Average or unknown

Comments

Section 2: Dwelling Construction Details

Thermal Mass Parameter Precise calculation

Thermal Mass 188.55 kJ/m²K

Comments

External Walls

Type	Cavity Wall		
Construction	Cavity wall; dense plaster, lightweight aggregate block, filled cavity, any outside structure		
U-value	0.18	W/m ² K	U-value calculations should be provided to verify the u-value entered in the survey.
Gross Area	17.71	m ²	
Type	Steel Frame		
Construction	Steel frame wall (warm frame or hybrid construction)		
U-value	0.18	W/m ² K	U-value calculations should be provided to verify the u-value entered in the survey.
Gross Area	4.81	m ²	
Type	Steel Frame		
Construction	Steel frame wall (warm frame or hybrid construction)		
U-value	0.18	W/m ² K	U-value calculations should be provided to verify the u-value entered in the survey.
Gross Area	35.58	m ²	

Comments

Party Walls

DWELLING SIGN OFF REPORT



Type	Construction	U-Value (W/m²K)	Area (m²)
Filled Cavity with Edge Sealing	Single plasterboard on dabs on both sides, dense blocks, cavity or cavity fill	0.00	50.28
Comments			

External Roofs

Type	External Flat Roof		
Construction	Plasterboard, insulated flat roof		
U-value	0.12	W/m²K	U-value calculations should be provided to verify the u-value entered in the survey.
Gross Area	44.95	m²	
Type	External Flat Roof		
Construction	Plasterboard, insulated flat roof		
U-value	0.12	W/m²K	U-value calculations should be provided to verify the u-value entered in the survey.
Gross Area	23.60	m²	
Comments			

Opening Types

Description	Type	Glazing	Frame Type	U Value (W/m²K)
Window	Window	Double glazed		1.20
Comments				

Openings

Name	Opening Type	Location	Orientation	Area (m²)
SE1	Window	[1] External Wall	South East	2.48
SE2	Window	[3] Dormer Frontal Face	South East	6.00
SE3	Window	[3] Dormer Frontal Face	South East	2.15
SE4	Window	[3] Dormer Frontal Face	South East	4.50
SE5	Window	[3] Dormer Frontal Face	South East	4.50
Comments				

Thermal Bridging

	Default	
Y-value	0.150	W/m²K
Comments		

DWELLING SIGN OFF REPORT



Where specific construction details have been used documentary evidence should be provided to the SAP assessor, usually in the form of signed checklists.

Pressure Testing

Yes

As Built AP₅₀

m³/(h.m²) @ 50 Pa

Where an air pressure test has been carried out a copy of the test certificate should be forwarded to the SAP assessor.

Comments

Section 3: Dwelling Systems

Mechanical Ventilation

Type

Brand Model

SFP

Efficiency

Duct Type

Duct Brand Model

Number of Wet Rooms

Comments

Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				0
Number of passive vents				0
Number of flueless gas fires				0

Comments

Internal Lighting

Total number of light fittings

Total number of L.E.L. fittings

Percentage of L.E.L. fittings %

Comments

External Lighting

External lights fitted

Comments

DWELLING SIGN OFF REPORT



Electricity Tariff	24 Hour
Comments	

Main Heating 1	SAP table
Fuel Type	electricity
Main Heating	Electricity SEH Underfloor heating in thin screed (standard tariff)
Efficiency (SAP Table)	100.0 %
Brand, Model	
Flue Type	
Fan Assisted Flue	
Heat Emitter	
Flow Temperature	
Comments	

Heating Controls

Description	CMD Time and temperature zone control
Boiler Interlock	
Delayed Start Stat	
Compensator	
Comments	

Main Heating 2	None
Comments	

Water Heating System	HES Instantaneous at point of use
Water Heating	Independent
Supplementary Immersion	
Comments	

Section 4: Dwelling Renewable Energy

Photovoltaic Panels	One Dwelling			
PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
1.20	South	30°	None Or Little	Yes
MCS Certificate available?				

DWELLING SIGN OFF REPORT



Comments

Section 5: Declaration

I confirm that all details provided above are accurate to the best of my knowledge.

Signed

Date



SAP Report Submission for Building Regulations Compliance

Client: Quad Architects

Project:
UB7 7QR

Contact: Dion Mellows
SHA Environmental Limited
info@shaenvironmental.co.uk

Report Issue Date: 20/10/2021

EXCELLENCE
IN ENERGY
ASSESSMENT

PREDICTED ENERGY ASSESSMENT

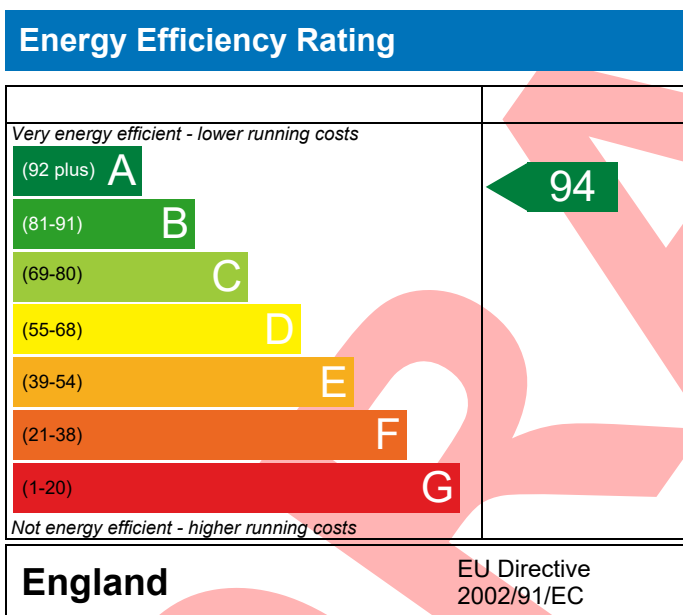


UB7 7QR

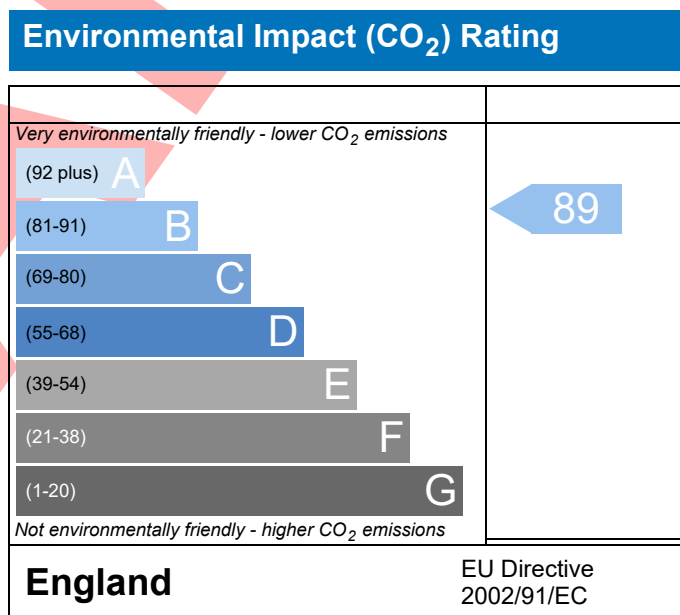
Dwelling type: House, Semi-Detached
 Date of assessment: 20/10/2021
 Produced by: SHA Environmental Limited
 Total floor area: 64.74 m²

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP2012 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.



The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO₂) emissions. The higher the rating the less impact it has on the environment.

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Designed)



Property Reference	210925	Issued on Date	20/10/2021
Assessment Reference	APARTMENT 3.01	Prop Type Ref	APARTMENT 3.01
Property	UB7 7QR		
SAP Rating	94 A	DER	16.03
Environmental	89 B	TER	25.05
CO ₂ Emissions (t/year)	0.71	% DER<TER	36.01
General Requirements Compliance	Fail	DFEE	38.41
		TREE	43.48
		% DFEE<TFEE	11.66
Assessor Details	Mr. Dion Mellows, SHA Environmental Limited, Tel: 02036370427, info@shaenvironmental.co.uk		Assessor ID
			G297-0001
Client			

SUMMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFE rate

1a TER and DER

Fuel for main heating	Electricity		
Fuel factor	1.55 (electricity)		
Target Carbon Dioxide Emission Rate (TER)	25.05	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	16.03	kgCO ₂ /m ²	Pass
	-9.02 (-36.0%)	kgCO ₂ /m ²	

1b TFE and DFEE

Target Fabric Energy Efficiency (TFEE)	43.48	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	38.41	kWh/m ² /yr	
	-5.1 (-11.7%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Roof	0.12 (max. 0.20)	0.12 (max. 0.35)	Pass
Openings	1.20 (max. 2.00)	1.20 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated using default γ -value of 0.15

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)	m ³ /(h.m ²) @ 50 Pa	
Maximum	10.0	m ³ /(h.m ²) @ 50 Pa	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system	Electric underfloor heating - Electric Underfloor heating in thin screed (standard tariff)	
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This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Designed)



Secondary heating system

None

5 Cylinder insulation

Hot water storage

No cylinder

6 Controls

Space heating controls

Time and temperature zone control

Pass

Hot water controls

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100

%

Minimum

75

%

Pass

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power

1.13

Maximum

1.5

Pass

MVHR efficiency

89

%

Minimum

70

%

Pass

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)

High

Fail

Based on:

Overshading

Average

Windows facing South East

19.63 m², No overhang

Air change rate

4.00 ach

Blinds/curtains

Dark-coloured curtain or roller blind, closed 50% of daylight hours

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

5.00 (design value)

m³/(h.m²) @ 50 Pa

Maximum

10.0

m³/(h.m²) @ 50 Pa

Pass

10 Key features

Party wall U-value

0.00

W/m²K

Roof U-value

0.12

W/m²K

Roof U-value

0.12

W/m²K

Photovoltaic array

1.20

kW

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

RECOMMENDATIONS

	Typical cost	Typical savings per year	Energy efficiency	Environmental impact	Result
Low energy lights			0	0	Already installed
Solar water heating	£4,000 - £6,000	£78	A 96	A 93	Recommended
Photovoltaic			0	0	Already installed
Wind turbine			0	0	Not applicable
Totals	£4,000 - £6,000	£78	A 96	A 93	

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	210925	Issued on Date	20/10/2021
Assessment Reference	APARTMENT 3.01	Prop Type Ref	APARTMENT 3.01
Property	UB7 7QR		

SAP Rating	94 A	DER	16.03	TER	25.05
Environmental	89 B	% DER<TER	36.01		
CO ₂ Emissions (t/year)	0.71	DFEE	38.41	TTEE	43.48
General Requirements Compliance	Fail	% DFEE<TFEE	11.66		

Assessor Details	Mr. Dion Mellows, SHA Environmental Limited, Tel: 02036370427, info@shaenvironmental.co.uk	Assessor ID	G297-0001
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Client	
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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	64.7400 (1b)	x 2.6200 (2b)	= 169.6188 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 169.6188 (5)

2. Ventilation rate

											main	secondary	other	total	m3 per hour			
											heating	heating						
Number of chimneys											0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues											0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans																	0 * 10 =	0.0000 (7a)
Number of passive vents																	0 * 10 =	0.0000 (7b)
Number of flueless gas fires																	0 * 40 =	0.0000 (7c)
											Air changes per hour							
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =											0.0000 / (5) =							0.0000 (8)
Pressure test											Yes							
Measured/design AP50																		5.0000
Infiltration rate																		0.2500 (18)
Number of sides sheltered																		3 (19)
Shelter factor											(20) = 1 - [0.075 x (19)] =							0.7750 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =							0.1938 (21)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec						
Wind speed	4.2000	4.0000	4.0000	3.7000	3.8000	3.5000	3.6000	3.4000	3.4000	3.7000	3.5000	4.0000	(22)					
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9500	0.8750	0.9000	0.8500	0.8500	0.9250	0.8750	1.0000	(22a)					
Adj infilt rate	0.2034	0.1938	0.1938	0.1792	0.1841	0.1695	0.1744	0.1647	0.1647	0.1792	0.1695	0.1938	(22b)					
Balanced mechanical ventilation with heat recovery																		
If mechanical ventilation:													0.5000 (23a)					
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													75.6500 (23c)					
Effective ac	0.3252	0.3155	0.3155	0.3010	0.3058	0.2913	0.2961	0.2864	0.2864	0.3010	0.2913	0.3155	(25)					

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Window (Uw = 1.20)			19.6300	1.1450	22.4771		(27)
External Wall	17.7100	2.4800	15.2300	0.1800	2.7414	140.0000	2132.2000 (29a)
Dormer Cheek	4.8100		4.8100	0.1800	0.8658	14.0000	67.3400 (29a)
Dormer Frontal Face	35.5800	17.1500	18.4300	0.1800	3.3174	14.0000	258.0200 (29a)
Flat HLR	44.9500		44.9500	0.1200	5.3940	9.0000	404.5500 (30)
Dormer Flat Roof	23.6000		23.6000	0.1200	2.8320	9.0000	212.4000 (30)
Total net area of external elements Aum(A, m ²)			126.6500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	37.6277			(33)
Wall to Dwelling			50.2800	0.0000	0.0000	70.0000	3519.6000 (32)
Party Floor			64.7400			80.0000	5179.2000 (32d)
Internal Wall			48.1600			9.0000	433.4400 (32c)
Heat capacity Cm = Sum (A x k)						(28)...(30) + (32) + (32a)...(32e) =	12206.7500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							188.5504 (35)
Thermal bridges (Default value 0.150 * total exposed area)							18.9975 (36)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF HEAT DEMAND 09 Jan 2014

Total fabric heat loss (33) + (36) = 56.6252 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	18.2021	17.6599	17.6599	16.8465	17.1176	16.3042	16.5754	16.0331	16.0331	16.8465	16.3042	17.6599	(38)
Heat transfer coeff	74.8273	74.2851	74.2851	73.4717	73.7428	72.9294	73.2006	72.6583	72.6583	73.4717	72.9294	74.2851	(39)
Average = Sum(39)m / 12 =												73.5621	(39)
HLP	1.1558	1.1474	1.1474	1.1349	1.1391	1.1265	1.1307	1.1223	1.1223	1.1349	1.1265	1.1474	(40)
HLP (average)												1.1363	(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 2.1120 (42)
Average daily hot water use (litres/day) 84.3601 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	92.7961	89.4217	86.0473	82.6729	79.2985	75.9241	75.9241	79.2985	82.6729	86.0473	89.4217	92.7961	(44)
Energy conte	137.6139	120.3580	124.1987	108.2794	103.8967	89.6549	83.0785	95.3338	96.4724	112.4292	122.7253	133.2717	(45)
Energy content (annual)										Total = Sum(45)m =		1327.3126	(45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
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	116.9718	102.3043	105.5689	92.0375	88.3122	76.2067	70.6167	81.0337	82.0015	95.5649	104.3165	113.2810	(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	116.9718	102.3043	105.5689	92.0375	88.3122	76.2067	70.6167	81.0337	82.0015	95.5649	104.3165	113.2810	(64)
RHI water heating demand													
Heat gains from water heating, kWh/month	29.2430	25.5761	26.3922	23.0094	22.0780	19.0517	17.6542	20.2584	20.5004	23.8912	26.0791	28.3202	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	41.1707	36.5674	29.7386	22.5141	16.8295	14.2082	15.3525	19.9557	26.7845	34.0091	39.6936	42.3150	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	275.7075	278.5685	271.3589	256.0105	236.6360	218.4267	206.2617	203.4008	210.6103	225.9587	245.3332	263.5425	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	(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)	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	(71)
Water heating gains (Table 5)	39.3051	38.0596	35.4734	31.9575	29.6748	26.4607	23.7287	27.2291	28.4727	32.1118	36.2210	38.0648	(72)
Total internal gains	448.2073	445.2196	428.5950	402.5062	375.1644	351.1196	337.3670	342.6096	357.8917	384.1037	413.2719	435.9464	(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		
Southeast	19.6300				41.7137		0.7600		0.0000		0.7700		479.1849 (77)
Solar gains	479.1849	710.6295	981.9314	1259.0738	1370.0142	1458.1619	1389.7860	1290.7377	1140.3671	861.8539	554.3509	393.1141	(83)
Total gains	927.3922	1155.8491	1410.5264	1661.5799	1745.1786	1809.2816	1727.1530	1633.3473	1498.2588	1245.9576	967.6229	829.0605	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	45.3145	45.6453	45.6453	46.1506	45.9809	46.4938	46.3216	46.6673	46.6673	46.1506	46.4938	45.6453	
alpha	4.0210	4.0430	4.0430	4.0767	4.0654	4.0996	4.0881	4.1112	4.1112	4.0767	4.0996	4.0430	
util living area	0.8847	0.7949	0.6444	0.4650	0.3231	0.1853	0.1102	0.1245	0.2659	0.5161	0.7924	0.9129	(86)
MIT	20.4448	20.6388	20.8162	20.9054	20.9280	20.9336	20.9338	20.9341	20.9324	20.8990	20.6978	20.3698	(87)
Th 2	19.9555	19.9623	19.9623	19.9725	19.9691	19.9793	19.9759	19.9827	19.9827	19.9725	19.9793	19.9623	(88)
util rest of house	0.8640	0.7654	0.6058	0.4240	0.2806	0.1442	0.0668	0.0793	0.2171	0.4636	0.7571	0.8958	(89)

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MIT 2	19.2587	19.5183	19.7379	19.8484	19.8675	19.8824	19.8789	19.8862	19.8853	19.8446	19.6167	19.1639 (90)
Living area fraction									fLA = Living area / (4) =			0.3732 (91)
MIT	19.7013	19.9365	20.1403	20.2428	20.2633	20.2747	20.2726	20.2773	20.2761	20.2381	20.0201	19.6139 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7013	19.9365	20.1403	20.2428	20.2633	20.2747	20.2726	20.2773	20.2761	20.2381	20.0201	19.6139 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8583	0.7646	0.6126	0.4349	0.2928	0.1561	0.0794	0.0924	0.2312	0.4775	0.7586	0.8893 (94)	
Useful gains	795.9897	883.7355	864.1195	722.6287	510.9794	282.4626	137.0692	150.9252	346.3685	594.8967	734.0866	737.2724 (95)	
Ext temp.	5.2000	5.7000	7.6000	10.2000	13.3000	16.4000	18.4000	18.2000	15.5000	11.9000	8.1000	5.2000 (96)	
Heat loss rate W													
	1085.0963	1057.5559	931.5582	737.8649	513.4919	282.5805	137.0732	150.9329	347.0211	612.6136	869.3273	1070.7383 (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													
	215.0953	116.8073	50.1744	10.9701	1.8693	0.0000	0.0000	0.0000	0.0000	13.1814	97.3733	248.0987 (98)	
Space heating												753.5698 (98)	
RHI space heating demand												754 (98)	

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SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
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1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	64.7400 (1b)	x 2.6200 (2b)	= 169.6188 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 169.6188 (5)

2. Ventilation rate

	main		secondary		other		total		m3 per hour			
	heating		heating									
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)			
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)			
Number of intermittent fans							0 * 10 =	0.0000	(7a)			
Number of passive vents							0 * 10 =	0.0000	(7b)			
Number of flueless gas fires							0 * 40 =	0.0000	(7c)			
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000	(8)			
Pressure test								Yes				
Measured/design AP50								5.0000				
Infiltration rate								0.2500	(18)			
Number of sides sheltered								3	(19)			
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.7750	(20)			
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1938	(21)			
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.2470	0.2422	0.2373	0.2131	0.2083	0.1841	0.1841	0.1792	0.1938	0.2083	0.2180	0.2277 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												75.6500 (23c)
Effective ac	0.3688	0.3639	0.3591	0.3349	0.3300	0.3058	0.3058	0.3010	0.3155	0.3300	0.3397	0.3494 (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	
Window (Uw = 1.20)			19.6300	1.1450	22.4771			(27)
External Wall	17.7100	2.4800	15.2300	0.1800	2.7414	140.0000	2132.2000	(29a)
Dormer Cheek	4.8100		4.8100	0.1800	0.8658	14.0000	67.3400	(29a)
Dormer Frontal Face	35.5800	17.1500	18.4300	0.1800	3.3174	14.0000	258.0200	(29a)
Flat HLR	44.9500		44.9500	0.1200	5.3940	9.0000	404.5500	(30)
Dormer Flat Roof	23.6000		23.6000	0.1200	2.8320	9.0000	212.4000	(30)
Total net area of external elements Aum(A, m2)			126.6500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...	(30) + (32) =	37.6277			(33)
Wall to Dwelling			50.2800	0.0000	0.0000	70.0000	3519.6000	(32)
Party Floor			64.7400			80.0000	5179.2000	(32d)
Internal Wall			48.1600			9.0000	433.4400	(32c)
Heat capacity Cm = Sum(A x k)					(28)...	(30) + (32) + (32a)...	(32e) =	12206.7500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								188.5504 (35)
Thermal bridges (Default value 0.150 * total exposed area)								18.9975 (36)
Total fabric heat loss						(33) + (36) =		56.6252 (37)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1120 (42)
Average daily hot water use (litres/day)												84.3601 (43)
Daily hot water use	Jan 92.7961	Feb 89.4217	Mar 86.0473	Apr 82.6729	May 79.2985	Jun 75.9241	Jul 75.9241	Aug 79.2985	Sep 82.6729	Oct 86.0473	Nov 89.4217	Dec 92.7961 (44)

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Energy conte	137.6139	120.3580	124.1987	108.2794	103.8967	89.6549	83.0785	95.3338	96.4724	112.4292	122.7253	133.2717 (45)
Energy content (annual)										Total = Sum (45)m =		1327.3126 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
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												
Solar input	116.9718	102.3043	105.5689	92.0375	88.3122	76.2067	70.6167	81.0337	82.0015	95.5649	104.3165	113.2810 (62)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
								Solar input (sum of months) = Sum (63)m =				0.0000 (63)
Output from w/h	116.9718	102.3043	105.5689	92.0375	88.3122	76.2067	70.6167	81.0337	82.0015	95.5649	104.3165	113.2810 (64)
								Total per year (kWh/year) = Sum (64)m =				1128.2157 (64)
Heat gains from water heating, kWh/month												
	29.2430	25.5761	26.3922	23.0094	22.0780	19.0517	17.6542	20.2584	20.5004	23.8912	26.0791	28.3202 (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	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	41.1707	36.5674	29.7386	22.5141	16.8295	14.2082	15.3525	19.9557	26.7845	34.0091	39.6936	42.3150 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	275.7075	278.5685	271.3589	256.0105	236.6360	218.4267	206.2617	203.4008	210.6103	225.9587	245.3332	263.5425 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840 (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)	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801 (71)
Water heating gains (Table 5)	39.3051	38.0596	35.4734	31.9575	29.6748	26.4607	23.7287	27.2291	28.4727	32.1118	36.2210	38.0648 (72)
Total internal gains	448.2073	445.2196	428.5950	402.5062	375.1644	351.1196	337.3670	342.6096	357.8917	384.1037	413.2719	435.9464 (73)

6. Solar gains

[Jan]												
					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d			Gains W
Southeast					19.6300	36.7938	0.7600	0.0000	0.7700			422.6683 (77)
Solar gains	422.6683	719.9604	985.0813	1220.5634	1367.1328	1357.2464	1308.5304	1199.1831	1066.6347	795.7097	506.2592	361.7160 (83)
Total gains	870.8756	1165.1801	1413.6763	1623.0696	1742.2972	1708.3660	1645.8974	1541.7927	1424.5264	1179.8134	919.5311	797.6624 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	43.8835	44.0380	44.1936	44.9885	45.1509	45.9809	45.9809	46.1506	45.6453	45.1509	44.8272	44.5082
alpha	3.9256	3.9359	3.9462	3.9992	4.0101	4.0654	4.0654	4.0767	4.0430	4.0101	3.9885	3.9672
util living area	0.9188	0.8213	0.6931	0.5359	0.3947	0.2752	0.1969	0.2189	0.3561	0.6130	0.8493	0.9362 (86)
MIT	20.2756	20.5530	20.7538	20.8756	20.9180	20.9310	20.9330	20.9329	20.9259	20.8547	20.5684	20.2162 (87)
Th 2	19.9252	19.9286	19.9319	19.9488	19.9521	19.9691	19.9691	19.9725	19.9623	19.9521	19.9454	19.9386 (88)
util rest of house	0.9034	0.7946	0.6572	0.4951	0.3520	0.2313	0.1509	0.1701	0.3039	0.5628	0.8209	0.9234 (89)
MIT 2	19.0005	19.3746	19.6324	19.7922	19.8408	19.8700	19.8714	19.8749	19.8593	19.7776	19.4191	18.9297 (90)
Living area fraction									fLA = Living area / (4) =			0.3732 (91)
MIT	19.4764	19.8143	20.0509	20.1965	20.2428	20.2659	20.2676	20.2697	20.2573	20.1796	19.8480	19.4098 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4764	19.8143	20.0509	20.1965	20.2428	20.2659	20.2676	20.2697	20.2573	20.1796	19.8480	19.4098 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.8959	0.7916	0.6614	0.5049	0.3640	0.2440	0.1642	0.1843	0.3189	0.5740	0.8181	0.9160 (94)
Useful gains	780.2386	922.3087	934.9781	819.4779	634.1224	416.7914	270.3095	284.0811	454.2454	677.2559	752.2384	730.6732 (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	1172.6397	1148.3482	1039.6943	851.4127	641.5488	417.8222	270.4559	284.3167	457.3990	719.4101	964.2702	1158.7277 (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	291.9464	151.8986	77.9089	22.9931	5.5253	0.0000	0.0000	0.0000	0.0000	31.3627	152.6629	318.4725 (98)
Space heating												1052.7703 (98)
Space heating per m2										(98) / (4) =		16.2615 (99)

8c. Space cooling requirement



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Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1052.7703 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	291.9464	151.8986	77.9089	22.9931	5.5253	0.0000	0.0000	0.0000	0.0000	31.3627	152.6629	318.4725	(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)	291.9464	151.8986	77.9089	22.9931	5.5253	0.0000	0.0000	0.0000	0.0000	31.3627	152.6629	318.4725	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	116.9718	102.3043	105.5689	92.0375	88.3122	76.2067	70.6167	81.0337	82.0015	95.5649	104.3165	113.2810	(64)
Efficiency of water heater (217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(216)
Fuel for water heating, kWh/month	116.9718	102.3043	105.5689	92.0375	88.3122	76.2067	70.6167	81.0337	82.0015	95.5649	104.3165	113.2810	(219)
Water heating fuel used												1128.2157	(219)
Annual totals kWh/year													
Space heating fuel - main system												1052.7703	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 1.4125)													
mechanical ventilation fans (SFP = 1.4125)													292.2956 (230a)
Total electricity for the above, kWh/year													292.2956 (231)
Electricity for lighting (calculated in Appendix L)													290.8350 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.20 * 1080 * 1.00) =										-1036.3436		-1036.3436	(233)
Total delivered energy for all uses												1727.7729	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1052.7703	6.6100	69.5881 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1128.2157	6.6100	74.5751 (247)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Energy for lighting	290.8350	13.1900	38.3611 (250)
Additional standing charges			70.0000 (251)
Energy saving/generation technologies			
PV Unit	-1036.3436	13.1900	-136.6937 (252)
Total energy cost			115.8306 (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] =	0.4433 (257)
SAP value		93.8158
SAP rating (Section 12)		94 (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	1052.7703	0.5190	546.3878 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1128.2157	0.5190	585.5440 (264)
Space and water heating			1131.9317 (265)
Pumps and fans	292.2956	0.5190	151.7014 (267)
Energy for lighting	290.8350	0.5190	150.9433 (268)
Energy saving/generation technologies			
PV Unit	-1036.3436	0.5190	-537.8623 (269)
Total kg/year			896.7142 (272)
CO2 emissions per m2			13.8500 (273)
EI value			89.0505
EI rating			89 (274)
EI band			B

Calculation of stars for heating and DHW

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Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

Main heating energy efficiency	$6.61 \times (1 + 0.29 \times 0.25) / 1.0000 = 7.089$, stars = 3
Main heating environmental impact	$0.519 \times (1 + 0.29 \times 0.25) / 1.0000 = 0.5566$, stars = 1
Water heating energy efficiency	$6.61 / 1.0000 = 6.610$, stars = 3
Water heating environmental impact	$0.519 / 1.0000 = 0.5190$, stars = 2

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	64.7400 (1b)	x 2.6200 (2b)	= 169.6188 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 169.6188 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.2500 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1938 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.8000	3.5000	3.6000	3.4000	3.4000	3.7000	3.5000	4.0000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9500	0.8750	0.9000	0.8500	0.8500	0.9250	0.8750	1.0000 (22a)
Adj infilt rate	0.2034	0.1938	0.1938	0.1792	0.1841	0.1695	0.1744	0.1647	0.1647	0.1792	0.1695	0.1938 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												75.6500 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.3252	0.3155	0.3155	0.3010	0.3058	0.2913	0.2961	0.2864	0.2864	0.3010	0.2913	0.3155 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Window (Uw = 1.20)			19.6300	1.1450	22.4771		(27)
External Wall	17.7100	2.4800	15.2300	0.1800	2.7414	140.0000	2132.2000 (29a)
Dormer Cheek	4.8100		4.8100	0.1800	0.8658	14.0000	67.3400 (29a)
Dormer Frontal Face	35.5800	17.1500	18.4300	0.1800	3.3174	14.0000	258.0200 (29a)
Flat HLR	44.9500		44.9500	0.1200	5.3940	9.0000	404.5500 (30)
Dormer Flat Roof	23.6000		23.6000	0.1200	2.8320	9.0000	212.4000 (30)
Total net area of external elements Aum(A, m ²)			126.6500				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	37.6277	(33)
Wall to Dwelling			50.2800	0.0000	0.0000	70.0000	3519.6000 (32)
Party Floor			64.7400			80.0000	5179.2000 (32d)
Internal Wall			48.1600			9.0000	433.4400 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		12206.7500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							188.5504 (35)
Thermal bridges (Default value 0.150 * total exposed area)							18.9975 (36)
Total fabric heat loss					(33) + (36) =		56.6252 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	18.2021	17.6599	17.6599	16.8465	17.1176	16.3042	16.5754	16.0331	16.0331	16.8465	16.3042	17.6599 (38)
Heat transfer coeff	74.8273	74.2851	74.2851	73.4717	73.7428	72.9294	73.2006	72.6583	72.6583	73.4717	72.9294	74.2851 (39)
Average = Sum(39)m / 12 =												73.5621 (39)
HLP	1.1558	1.1474	1.1474	1.1349	1.1391	1.1265	1.1307	1.1223	1.1223	1.1349	1.1265	1.1474 (40)
HLP (average)												1.1363 (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												2.1120 (42)
Average daily hot water use (litres/day)												84.3601 (43)
Daily hot water use	92.7961	89.4217	86.0473	82.6729	79.2985	75.9241	75.9241	79.2985	82.6729	86.0473	89.4217	92.7961 (44)



FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

Energy conte	137.6139	120.3580	124.1987	108.2794	103.8967	89.6549	83.0785	95.3338	96.4724	112.4292	122.7253	133.2717 (45)
Energy content (annual)										Total = Sum (45)m =		1327.3126 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
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												
Solar input	116.9718	102.3043	105.5689	92.0375	88.3122	76.2067	70.6167	81.0337	82.0015	95.5649	104.3165	113.2810 (62)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	116.9718	102.3043	105.5689	92.0375	88.3122	76.2067	70.6167	81.0337	82.0015	95.5649	104.3165	113.2810 (64)
Heat gains from water heating, kWh/month	29.2430	25.5761	26.3922	23.0094	22.0780	19.0517	17.6542	20.2584	20.5004	23.8912	26.0791	28.3202 (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	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	41.1707	36.5674	29.7386	22.5141	16.8295	14.2082	15.3525	19.9557	26.7845	34.0091	39.6936	42.3150 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	275.7075	278.5685	271.3589	256.0105	236.6360	218.4267	206.2617	203.4008	210.6103	225.9587	245.3332	263.5425 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840 (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)	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801 (71)
Water heating gains (Table 5)	39.3051	38.0596	35.4734	31.9575	29.6748	26.4607	23.7287	27.2291	28.4727	32.1118	36.2210	38.0648 (72)
Total internal gains	448.2073	445.2196	428.5950	402.5062	375.1644	351.1196	337.3670	342.6096	357.8917	384.1037	413.2719	435.9464 (73)

6. Solar gains

[Jan]													
	Area m2				Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
Southeast	19.6300				41.7137		0.7600		0.0000		0.7700		479.1849 (77)
Solar gains	479.1849	710.6295	981.9314	1259.0738	1370.0142	1458.1619	1389.7860	1290.7377	1140.3671	861.8539	554.3509	393.1141 (83)	
Total gains	927.3922	1155.8491	1410.5264	1661.5799	1745.1786	1809.2816	1727.1530	1633.3473	1498.2588	1245.9576	967.6229	829.0605 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	45.3145	45.6453	45.6453	46.1506	45.9809	46.4938	46.3216	46.6673	46.6673	46.1506	46.4938	45.6453
alpha	4.0210	4.0430	4.0430	4.0767	4.0654	4.0996	4.0881	4.1112	4.1112	4.0767	4.0996	4.0430
util living area	0.8847	0.7949	0.6444	0.4650	0.3231	0.1853	0.1102	0.1245	0.2659	0.5161	0.7924	0.9129 (86)
MIT	20.4448	20.6388	20.8162	20.9054	20.9280	20.9336	20.9338	20.9341	20.9324	20.8990	20.6978	20.3698 (87)
Th 2	19.9555	19.9623	19.9623	19.9725	19.9691	19.9793	19.9759	19.9827	19.9827	19.9725	19.9793	19.9623 (88)
util rest of house	0.8640	0.7654	0.6058	0.4240	0.2806	0.1442	0.0668	0.0793	0.2171	0.4636	0.7571	0.8958 (89)
MIT 2	19.2587	19.5183	19.7379	19.8484	19.8675	19.8824	19.8789	19.8862	19.8853	19.8446	19.6167	19.1639 (90)
Living area fraction									fLA = Living area / (4) =			0.3732 (91)
MIT	19.7013	19.9365	20.1403	20.2428	20.2633	20.2747	20.2726	20.2773	20.2761	20.2381	20.0201	19.6139 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7013	19.9365	20.1403	20.2428	20.2633	20.2747	20.2726	20.2773	20.2761	20.2381	20.0201	19.6139 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.8583	0.7646	0.6126	0.4349	0.2928	0.1561	0.0794	0.0924	0.2312	0.4775	0.7586	0.8893 (94)
Ext temp.	795.9897	883.7355	864.1195	722.6287	510.9794	282.4626	137.0692	150.9252	346.3685	594.8967	734.0866	737.2724 (95)
Heat loss rate W	5.2000	5.7000	7.6000	10.2000	13.3000	16.4000	18.4000	18.2000	15.5000	11.9000	8.1000	5.2000 (96)
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	215.0953	116.8073	50.1744	10.9701	1.8693	0.0000	0.0000	0.0000	0.0000	13.1814	97.3733	248.0987 (98)
Space heating per m2												753.5698 (98)
										(98) / (4) =		11.6399 (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)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													753.5698 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	215.0953	116.8073	50.1744	10.9701	1.8693	0.0000	0.0000	0.0000	0.0000	13.1814	97.3733	248.0987	(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)	215.0953	116.8073	50.1744	10.9701	1.8693	0.0000	0.0000	0.0000	0.0000	13.1814	97.3733	248.0987	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	116.9718	102.3043	105.5689	92.0375	88.3122	76.2067	70.6167	81.0337	82.0015	95.5649	104.3165	113.2810	(64)
Efficiency of water heater (217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(216)
Fuel for water heating, kWh/month	116.9718	102.3043	105.5689	92.0375	88.3122	76.2067	70.6167	81.0337	82.0015	95.5649	104.3165	113.2810	(219)
Water heating fuel used												1128.2157	(219)
Annual totals kWh/year													
Space heating fuel - main system												753.5698	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 1.4125)													
mechanical ventilation fans (SFP = 1.4125)													292.2956 (230a)
Total electricity for the above, kWh/year													292.2956 (231)
Electricity for lighting (calculated in Appendix L)													290.8350 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.20 * 1151 * 1.00) =										-1105.3291		-1105.3291	(233)
Total delivered energy for all uses												1359.5870	(238)

10a. Fuel costs - using BEDF prices (483)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	753.5698	12.2200	92.0862 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1128.2157	12.2200	137.8680 (247)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Energy for lighting	290.8350	19.1200	55.6076 (250)
Additional standing charges			9.0000 (251)
Energy saving/generation technologies			
PV Unit	-1105.3291	19.1200	-211.3389 (252)
Total energy cost			83.2229 (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	753.5698	0.5190	391.1027 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1128.2157	0.5190	585.5440 (264)
Space and water heating			976.6467 (265)
Pumps and fans	292.2956	0.5190	151.7014 (267)
Energy for lighting	290.8350	0.5190	150.9433 (268)
Energy saving/generation technologies			
PV Unit	-1105.3291	0.5190	-573.6658 (269)
Total kg/year			705.6257 (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	753.5698	3.0700	2313.4592 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1128.2157	3.0700	3463.6223 (264)
Space and water heating			5777.0815 (265)
Pumps and fans	292.2956	3.0700	897.3475 (267)
Energy for lighting	290.8350	3.0700	892.8633 (268)
Energy saving/generation technologies			
PV Unit	-1105.3291	3.0700	-3393.3602 (269)
Primary energy kWh/year			4173.9321 (272)
Primary energy kWh/m2/year			64.4722 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: A 94
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	Recommended
O	Not considered
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U Solar photovoltaic panels	Already installed
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
N Solar water heating	+ 2.1	-£ 78	-345 kg (48.8%)

Recommended measures	Typical annual savings		Energy efficiency	Environmental impact
Solar water heating	£78	5.32 kg/m²	A 96	A 93
Total Savings	£78	5.32 kg/m²		

Potential energy efficiency rating: A 96
Potential environmental impact rating: A 93

Fuel prices for cost data on this page from database revision number 483 TEST (30 Sep 2021)
Recommendation texts revision number 4.9c (22 Feb 2014)

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

	Current £295	Potential £217	Saving £78
Electricity			
Space heating	£101	£101	£0
Water heating	£138	£60	£78
Lighting	£56	£56	£0
Generated (PV)	-£211	-£211	£0
Total cost of fuels	£84	£6	£78
Total cost of uses	£84	£6	£78
Delivered energy	21 kWh/m²	11 kWh/m²	10 kWh/m²
Carbon dioxide emissions	0.7 tonnes	0.4 tonnes	0.3 tonnes
CO2 emissions per m²	11 kg/m²	6 kg/m²	5 kg/m²
Primary energy	64 kWh/m²	33 kWh/m²	31 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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	64.7400 (1b)	x 2.6200 (2b)	= 169.6188 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 169.6188 (5)

2. Ventilation rate

	main heating		secondary heating		other		total		m3 per hour			
Number of chimneys		0	+	0	+	0	=	0 * 40 =	0.0000 (6a)			
Number of open flues		0	+	0	+	0	=	0 * 20 =	0.0000 (6b)			
Number of intermittent fans								0 * 10 =	0.0000 (7a)			
Number of passive vents								0 * 10 =	0.0000 (7b)			
Number of flueless gas fires								0 * 40 =	0.0000 (7c)			
									Air changes per hour			
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =							0.0000 / (5) =	0.0000 (8)			
Pressure test									Yes			
Measured/design AP50									5.0000			
Infiltration rate									0.2500 (18)			
Number of sides sheltered									3 (19)			
Shelter factor								(20) = 1 - [0.075 x (19)] =	0.7750 (20)			
Infiltration rate adjusted to include shelter factor								(21) = (18) x (20) =	0.1938 (21)			
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.2470	0.2422	0.2373	0.2131	0.2083	0.1841	0.1841	0.1792	0.1938	0.2083	0.2180	0.2277 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
												0.5000 (23a)
												75.6500 (23c)
Effective ac	0.3688	0.3639	0.3591	0.3349	0.3300	0.3058	0.3058	0.3010	0.3155	0.3300	0.3397	0.3494 (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	
Window (Uw = 1.20)			19.6300	1.1450	22.4771			(27)
External Wall	17.7100	2.4800	15.2300	0.1800	2.7414	140.0000	2132.2000	(29a)
Dormer Cheek	4.8100		4.8100	0.1800	0.8658	14.0000	67.3400	(29a)
Dormer Frontal Face	35.5800	17.1500	18.4300	0.1800	3.3174	14.0000	258.0200	(29a)
Flat HLR	44.9500		44.9500	0.1200	5.3940	9.0000	404.5500	(30a)
Dormer Flat Roof	23.6000		23.6000	0.1200	2.8320	9.0000	212.4000	(30)
Total net area of external elements Aum(A, m2)			126.6500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	37.6277			(33)
Wall to Dwelling			50.2800	0.0000	0.0000	70.0000	3519.6000	(32)
Party Floor			64.7400			80.0000	5179.2000	(32d)
Internal Wall			48.1600			9.0000	433.4400	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		12206.7500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							188.5504	(35)
Thermal bridges (Default value 0.150 * total exposed area)							18.9975	(36)
Total fabric heat loss						(33) + (36) =	56.6252	(37)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1120 (42)
Average daily hot water use (litres/day)												84.3601 (43)
Daily hot water use	Jan 92.7961	Feb 89.4217	Mar 86.0473	Apr 82.6729	May 79.2985	Jun 75.9241	Jul 75.9241	Aug 79.2985	Sep 82.6729	Oct 86.0473	Nov 89.4217	Dec 92.7961 (44)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Energy content (annual)	137.6139	120.3580	124.1987	108.2794	103.8967	89.6549	83.0785	95.3338	96.4724	112.4292	122.7253	133.2717 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1327.3126 (45)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
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	116.9718	102.3043	105.5689	92.0375	88.3122	76.2067	70.6167	81.0337	82.0015	95.5649	104.3165	113.2810 (62)
Aperture area of solar collector												3.0000 (H1)
Zero-loss collector efficiency												0.7000 (H2)
Collector heat loss coefficient												1.8000 (H3)
Collector 2nd order heat loss coefficient												0.0050 (H3a)
Collector effective heat loss coefficient												1.8063 (H3b)
Collector performance ratio												2.5804 (H4)
Annual solar radiation per m2												1079.5246 (H5)
Overshading factor												0.8000 (H6)
Solar energy available												1813.6014 (H7)
Adjustment factor for showers												1.0000 (H7a)
Solar-to-load ratio												1.3664 (H8)
Utilisation factor												0.5190 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												84.3601 (H14)
Volume ratio Veff/V												0.8890 (H15)
Solar storage volume factor												0.9765 (H16)
Solar input												-808.1590 (H17)
Solar input	-23.4350	-39.1063	-66.6025	-89.2604	-110.2738	-108.4167	-106.9839	-93.4724	-73.2076	-49.9922	-27.7973	-19.6111 (63)
Solar input (sum of months) = Sum (63)m =												-808.1590 (63)
Output from w/h	93.5368	63.1980	38.9664	2.7771	0.0000	0.0000	0.0000	0.0000	8.7939	45.5727	76.5192	93.6699 (64)
Total per year (kWh/year) = Sum (64)m =												423.0340 (64)
Heat gains from water heating, kWh/month	29.2430	25.5761	26.3922	23.0094	22.0780	19.0517	17.6542	20.2584	20.5004	23.8912	26.0791	28.3202 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	41.1707	36.5674	29.7386	22.5141	16.8295	14.2082	15.3525	19.9557	26.7845	34.0091	39.6936	42.3150 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	275.7075	278.5685	271.3589	256.0105	236.6360	218.4267	206.2617	203.4008	210.6103	225.9587	245.3332	263.5425 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840 (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)	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801 (71)
Water heating gains (Table 5)	39.3051	38.0596	35.4734	31.9575	29.6748	26.4607	23.7287	27.2291	28.4727	32.1118	36.2210	38.0648 (72)
Total internal gains	448.2073	445.2196	428.5950	402.5062	375.1644	351.1196	337.3670	342.6096	357.8917	384.1037	413.2719	435.9464 (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							
Southeast	19.6300	36.7938	0.7600	0.0000	0.7700	422.6683 (77)						
Solar gains	422.6683	719.9604	985.0813	1220.5634	1367.1328	1357.2464	1308.5304	1199.1831	1066.6347	795.7097	506.2592	361.7160 (83)
Total gains	870.8756	1165.1801	1413.6763	1623.0696	1742.2972	1708.3660	1645.8974	1541.7927	1424.5264	1179.8134	919.5311	797.6624 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.8835	44.0380	44.1936	44.9885	45.1509	45.9809	45.9809	46.1506	45.6453	45.1509	44.8272	44.5082
alpha	3.9256	3.9359	3.9462	3.9992	4.0101	4.0654	4.0654	4.0767	4.0430	4.0101	3.9885	3.9672
util living area	0.9188	0.8213	0.6931	0.5359	0.3947	0.2752	0.1969	0.2189	0.3561	0.6130	0.8493	0.9362 (86)
MIT	20.2756	20.5530	20.7538	20.8756	20.9180	20.9310	20.9330	20.9329	20.9259	20.8547	20.5684	20.2162 (87)
Th 2	19.9252	19.9286	19.9319	19.9488	19.9521	19.9691	19.9691	19.9725	19.9623	19.9521	19.9454	19.9386 (88)
util rest of house	0.9034	0.7946	0.6572	0.4951	0.3520	0.2313	0.1509	0.1701	0.3039	0.5628	0.8209	0.9234 (89)
MIT 2	19.0005	19.3746	19.6324	19.7922	19.8408	19.8700	19.8714	19.8749	19.8593	19.7776	19.4191	18.9297 (90)
Living area fraction									fLA = Living area / (4) =			0.3732 (91)
MIT	19.4764	19.8143	20.0509	20.1965	20.2428	20.2659	20.2676	20.2697	20.2573	20.1796	19.8480	19.4098 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4764	19.8143	20.0509	20.1965	20.2428	20.2659	20.2676	20.2697	20.2573	20.1796	19.8480	19.4098 (93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8959	0.7916	0.6614	0.5049	0.3640	0.2440	0.1642	0.1843	0.3189	0.5740	0.8181	0.9160	(94)
Useful gains	780.2386	922.3087	934.9781	819.4779	634.1224	416.7914	270.3095	284.0811	454.2454	677.2559	752.2384	730.6732	(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	1172.6397	1148.3482	1039.6943	851.4127	641.5488	417.8222	270.4559	284.3167	457.3990	719.4101	964.2702	1158.7277	(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	291.9464	151.8986	77.9089	22.9931	5.5253	0.0000	0.0000	0.0000	0.0000	31.3627	152.6629	318.4725	(98)
Space heating												1052.7703	(98)
Space heating per m2												16.2615	(99)
												(98) / (4) =	

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													100.0000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													1052.7703	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	291.9464	151.8986	77.9089	22.9931	5.5253	0.0000	0.0000	0.0000	0.0000	31.3627	152.6629	318.4725	(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)	291.9464	151.8986	77.9089	22.9931	5.5253	0.0000	0.0000	0.0000	0.0000	31.3627	152.6629	318.4725	(211)	
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)	
Water heating														
Water heating requirement	93.5368	63.1980	38.9664	2.7771	0.0000	0.0000	0.0000	0.0000	8.7939	45.5727	76.5192	93.6699	(64)	
Efficiency of water heater													100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)	
Fuel for water heating, kWh/month	93.5368	63.1980	38.9664	2.7771	0.0000	0.0000	0.0000	0.0000	8.7939	45.5727	76.5192	93.6699	(219)	
Water heating fuel used													423.0340	(219)
Annual totals kWh/year														
Space heating fuel - main system													1052.7703	(211)
Space heating fuel - secondary													0.0000	(215)
Electricity for pumps and fans:														
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 1.4125)														
mechanical ventilation fans (SFP = 1.4125)														292.2956 (230a)
pump for solar water heating														50.0000 (230g)
Total electricity for the above, kWh/year														342.2956 (231)
Electricity for lighting (calculated in Appendix L)														290.8350 (232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 1.20 * 1080 * 1.00) =										-1036.3436			-1036.3436	(233)
Total delivered energy for all uses														1072.5913 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1052.7703	6.6100	69.5881	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	423.0340	6.6100	27.9626	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Pump for solar water heating	50.0000	13.1900	6.5950	(249)
Energy for lighting	290.8350	13.1900	38.3611	(250)
Additional standing charges			70.0000	(251)
Energy saving/generation technologies				
PV Unit	-1036.3436	13.1900	-136.6937	(252)
Total energy cost			75.8131	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):			0.4200	(256)
Energy cost factor (ECF)			0.2902	(257)
SAP value			95.9524	
SAP rating (Section 12)			96	(258)
SAP band			A	

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

Energy	Emission factor	Emissions
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FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

	kWh/year	kg CO2/kWh	kg CO2/year	
Space heating - main system 1	1052.7703	0.5190	546.3878	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	423.0340	0.5190	219.5547	(264)
Space and water heating			765.9424	(265)
Pumps and fans	342.2956	0.5190	177.6514	(267)
Energy for lighting	290.8350	0.5190	150.9433	(268)
Energy saving/generation technologies				
PV Unit	-1036.3436	0.5190	-537.8623	(269)
Total kg/year			556.6749	(272)
CO2 emissions per m2			8.6000	(273)
EI value			93.2026	
EI rating			93	(274)
EI band			A	

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	64.7400 (1b)	x 2.6200 (2b)	= 169.6188 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 169.6188 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour							
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)							
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)							
Number of intermittent fans					0 * 10 = 0.0000 (7a)							
Number of passive vents					0 * 10 = 0.0000 (7b)							
Number of flueless gas fires					0 * 40 = 0.0000 (7c)							
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)							
Pressure test					Yes							
Measured/design AP50					5.0000							
Infiltration rate					0.2500 (18)							
Number of sides sheltered					3 (19)							
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)							
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1938 (21)							
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	4.2000	4.0000	4.0000	3.7000	3.8000	3.5000	3.6000	3.4000	3.4000	3.7000	3.5000	4.0000 (22)
Adj infilt rate	1.0500	1.0000	1.0000	0.9250	0.9500	0.8750	0.9000	0.8500	0.8500	0.9250	0.8750	1.0000 (22a)
	0.2034	0.1938	0.1938	0.1792	0.1841	0.1695	0.1744	0.1647	0.1647	0.1792	0.1695	0.1938 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												75.6500 (23c)
Effective ac	0.3252	0.3155	0.3155	0.3010	0.3058	0.2913	0.2961	0.2864	0.2864	0.3010	0.2913	0.3155 (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	
Window (Uw = 1.20)			19.6300	1.1450	22.4771			(27)
External Wall	17.7100	2.4800	15.2300	0.1800	2.7414	140.0000	2132.2000	(29a)
Dormer Cheek	4.8100		4.8100	0.1800	0.8658	14.0000	67.3400	(29a)
Dormer Frontal Face	35.5800	17.1500	18.4300	0.1800	3.3174	14.0000	258.0200	(29a)
Flat HLR	44.9500		44.9500	0.1200	5.3940	9.0000	404.5500	(30)
Dormer Flat Roof	23.6000		23.6000	0.1200	2.8320	9.0000	212.4000	(30)
Total net area of external elements Aum(A, m2)			126.6500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		37.6277			(33)
Wall to Dwelling			50.2800	0.0000	0.0000	70.0000	3519.6000	(32)
Party Floor			64.7400			80.0000	5179.2000	(32d)
Internal Wall			48.1600			9.0000	433.4400	(32c)
Heat capacity Cm = Sum(A x k)					(28) ... (30) + (32) + (32a) ... (32e) =		12206.7500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							188.5504	(35)
Thermal bridges (Default value 0.150 * total exposed area)							18.9975	(36)
Total fabric heat loss						(33) + (36) =	56.6252	(37)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1120 (42)
Average daily hot water use (litres/day)												84.3601 (43)
Daily hot water use	Jan 92.7961	Feb 89.4217	Mar 86.0473	Apr 82.6729	May 79.2985	Jun 75.9241	Jul 75.9241	Aug 79.2985	Sep 82.6729	Oct 86.0473	Nov 89.4217	Dec 92.7961 (44)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

Energy content (annual)	137.6139	120.3580	124.1987	108.2794	103.8967	89.6549	83.0785	95.3338	96.4724	112.4292	122.7253	133.2717 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1327.3126 (45)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
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	116.9718	102.3043	105.5689	92.0375	88.3122	76.2067	70.6167	81.0337	82.0015	95.5649	104.3165	113.2810 (62)
Aperture area of solar collector												3.0000 (H1)
Zero-loss collector efficiency												0.7000 (H2)
Collector heat loss coefficient												1.8000 (H3)
Collector 2nd order heat loss coefficient												0.0050 (H3a)
Collector effective heat loss coefficient												1.8063 (H3b)
Collector performance ratio												2.5804 (H4)
Annual solar radiation per m2												1151.3844 (H5)
Overshading factor												0.8000 (H6)
Solar energy available												1934.3259 (H7)
Adjustment factor for showers												1.0000 (H7a)
Solar-to-load ratio												1.4573 (H8)
Utilisation factor												0.4965 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												84.3601 (H14)
Volume ratio Veff/V												0.8890 (H15)
Solar storage volume factor												0.9765 (H16)
Solar input												-824.6185 (H17)
Solar input	-25.9312	-37.7218	-64.8407	-89.5438	-106.9299	-112.4351	-109.7994	-97.6372	-76.3421	-52.9248	-29.7220	-20.7906 (63)
Solar input (sum of months) = Sum (63)m =												-824.6185 (63)
Output from w/h	91.0407	64.5825	40.7282	2.4938	0.0000	0.0000	0.0000	0.0000	5.6594	42.6400	74.5945	92.4904 (64)
Total per year (kWh/year) = Sum (64)m =												414.2295 (64)
Heat gains from water heating, kWh/month	29.2430	25.5761	26.3922	23.0094	22.0780	19.0517	17.6542	20.2584	20.5004	23.8912	26.0791	28.3202 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202	126.7202 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	41.1707	36.5674	29.7386	22.5141	16.8295	14.2082	15.3525	19.9557	26.7845	34.0091	39.6936	42.3150 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	275.7075	278.5685	271.3589	256.0105	236.6360	218.4267	206.2617	203.4008	210.6103	225.9587	245.3332	263.5425 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840	49.7840 (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)	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801	-84.4801 (71)
Water heating gains (Table 5)	39.3051	38.0596	35.4734	31.9575	29.6748	26.4607	23.7287	27.2291	28.4727	32.1118	36.2210	38.0648 (72)
Total internal gains	448.2073	445.2196	428.5950	402.5062	375.1644	351.1196	337.3670	342.6096	357.8917	384.1037	413.2719	435.9464 (73)

6. Solar gains

[Jan]												
Area	19.6300											
Solar flux	41.7137											
Specific data	0.7600											
FF	0.0000											
Access factor	0.7700											
Gains	479.1849											479.1849 (77)
Solar gains	479.1849	710.6295	981.9314	1259.0738	1370.0142	1458.1619	1389.7860	1290.7377	1140.3671	961.8539	554.3509	393.1141 (83)
Total gains	927.3922	1155.8491	1410.5264	1661.5799	1745.1786	1809.2816	1727.1530	1633.3473	1498.2588	1245.9576	967.6229	829.0605 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
Jan	45.3145	45.6453	45.6453	46.1506	45.9809	46.4938	46.3216	46.6673	46.6673	46.1506	46.4938	45.6453
alpha	4.0210	4.0430	4.0430	4.0767	4.0654	4.0996	4.0881	4.1112	4.1112	4.0767	4.0996	4.0430
util living area	0.8847	0.7949	0.6444	0.4650	0.3231	0.1853	0.1102	0.1245	0.2659	0.5161	0.7924	0.9129 (86)
MIT	20.4448	20.6388	20.8162	20.9054	20.9280	20.9336	20.9338	20.9341	20.9324	20.8990	20.6978	20.3698 (87)
Th 2	19.9555	19.9623	19.9623	19.9725	19.9691	19.9793	19.9759	19.9827	19.9827	19.9725	19.9793	19.9623 (88)
util rest of house	0.8640	0.7654	0.6058	0.4240	0.2806	0.1442	0.0668	0.0793	0.2171	0.4636	0.7571	0.8958 (89)
MIT 2	19.2587	19.5183	19.7379	19.8484	19.8675	19.8824	19.8789	19.8862	19.8853	19.8446	19.6167	19.1639 (90)
Living area fraction	19.7013	19.9365	20.1403	20.2428	20.2633	20.2747	20.2726	20.2773	20.2761	20.2381	20.0201	0.3732 (91)
MIT	19.7013	19.9365	20.1403	20.2428	20.2633	20.2747	20.2726	20.2773	20.2761	20.2381	20.0201	19.6139 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7013	19.9365	20.1403	20.2428	20.2633	20.2747	20.2726	20.2773	20.2761	20.2381	20.0201	19.6139 (93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8583	0.7646	0.6126	0.4349	0.2928	0.1561	0.0794	0.0924	0.2312	0.4775	0.7586	0.8893	(94)
Useful gains	795.9897	883.7355	864.1195	722.6287	510.9794	282.4626	137.0692	150.9252	346.3685	594.8967	734.0866	737.2724	(95)
Ext temp.	5.2000	5.7000	7.6000	10.2000	13.3000	16.4000	18.4000	18.2000	15.5000	11.9000	8.1000	5.2000	(96)
Heat loss rate W	1085.0963	1057.5559	931.5582	737.8649	513.4919	282.5805	137.0732	150.9329	347.0211	612.6136	869.3273	1070.7383	(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	215.0953	116.8073	50.1744	10.9701	1.8693	0.0000	0.0000	0.0000	0.0000	13.1814	97.3733	248.0987	(98)
Space heating												753.5698	(98)
Space heating per m2											(98) / (4) =	11.6399	(99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													100.0000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													753.5698	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	215.0953	116.8073	50.1744	10.9701	1.8693	0.0000	0.0000	0.0000	0.0000	13.1814	97.3733	248.0987	(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)	215.0953	116.8073	50.1744	10.9701	1.8693	0.0000	0.0000	0.0000	0.0000	13.1814	97.3733	248.0987	(211)	
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)	
Water heating														
Water heating requirement	91.0407	64.5825	40.7282	2.4938	0.0000	0.0000	0.0000	0.0000	5.6594	42.6400	74.5945	92.4904	(64)	
Efficiency of water heater	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(216)	
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)	
Fuel for water heating, kWh/month	91.0407	64.5825	40.7282	2.4938	0.0000	0.0000	0.0000	0.0000	5.6594	42.6400	74.5945	92.4904	(219)	
Water heating fuel used												414.2295	(219)	
Annual totals kWh/year														
Space heating fuel - main system												753.5698	(211)	
Space heating fuel - secondary												0.0000	(215)	
Electricity for pumps and fans:														
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 1.4125)														
mechanical ventilation fans (SFP = 1.4125)													292.2956	(230a)
pump for solar water heating													50.0000	(230g)
Total electricity for the above, kWh/year													342.2956	(231)
Electricity for lighting (calculated in Appendix L)													290.8350	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 1.20 * 1151 * 1.00) =									-1105.3291			-1105.3291	(233)	
Total delivered energy for all uses												695.6008	(238)	

10a. Fuel costs - using BEDF prices (483)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	753.5698	12.2200	92.0862	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	414.2295	12.2200	50.6188	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Pump for solar water heating	50.0000	19.1200	9.5600	(249)
Energy for lighting	290.8350	19.1200	55.6076	(250)
Additional standing charges			9.0000	(251)
Energy saving/generation technologies				
PV Unit	-1105.3291	19.1200	-211.3389	(252)
Total energy cost			5.5338	(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	753.5698	0.5190	391.1027	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	414.2295	0.5190	214.9851	(264)
Space and water heating			606.0878	(265)
Pumps and fans	342.2956	0.5190	177.6514	(267)
Energy for lighting	290.8350	0.5190	150.9433	(268)
Energy saving/generation technologies				
PV Unit	-1105.3291	0.5190	-573.6658	(269)
Total kg/year			361.0168	(272)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

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	753.5698	3.0700	2313.4592	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	414.2295	3.0700	1271.6846	(264)
Space and water heating			3585.1438	(265)
Pumps and fans	342.2956	3.0700	1050.8475	(267)
Energy for lighting	290.8350	3.0700	892.8633	(268)
Energy saving/generation technologies				
PV Unit	-1105.3291	3.0700	-3393.3602	(269)
Primary energy kWh/year			2135.4944	(272)
Primary energy kWh/m2/year			32.9857	(273)

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Designed)



Property Reference	210925	Issued on Date	20/10/2021
Assessment Reference	APARTMENT 3.01	Prop Type Ref	APARTMENT 3.01
Property	UB7 7QR		

SAP Rating	94 A	DER	16.03	TER	25.05
Environmental	89 B	% DER<TER	36.01		
CO ₂ Emissions (t/year)	0.71	DFEE	38.41	TFEE	43.48
General Requirements Compliance	Fail	% DFEE<TFEE	11.66		

Assessor Details	Mr. Dion Mellows, SHA Environmental Limited, Tel: 02036370427, info@shaenvironmental.co.uk	Assessor ID	G297-0001
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Client	
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SUMMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Electricity		
Fuel factor	1.55 (electricity)		
Target Carbon Dioxide Emission Rate (TER)	25.05	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	16.03	kgCO ₂ /m ²	Pass
	-9.02 (-36.0%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	43.48	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	38.41	kWh/m ² /yr	
	-5.1 (-11.7%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Roof	0.12 (max. 0.20)	0.12 (max. 0.35)	Pass
Openings	1.20 (max. 2.00)	1.20 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated using default γ -value of 0.15

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system	Electric underfloor heating - Electric Underfloor heating in thin screed (standard tariff)	
Secondary heating system	None	

5 Cylinder insulation

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Designed)



Hot water storage

No cylinder

6 Controls

Space heating controls

Time and temperature zone control

Pass

Hot water controls

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100

%

Minimum

75

%

Pass

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power

1.13

Maximum

1.5

Pass

MVHR efficiency

89

%

Minimum

70

%

Pass

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)

High

Fail

Based on:

Overshading

Average

Windows facing South East

19.63 m², No overhang

Air change rate

4.00 ach

Blinds/curtains

Dark-coloured curtain or roller blind, closed 50% of daylight hours

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

5.00 (design value)

Maximum

10.0

Pass

10 Key features

Party wall U-value

0.00

W/m²K

Roof U-value

0.12

W/m²K

Roof U-value

0.12

W/m²K

Photovoltaic array

1.20

kW

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)



Property Reference	210925	Issued on Date	20/10/2021
Assessment Reference	APARTMENT 3.01	Prop Type Ref	APARTMENT 3.01
Property	UB7 7QR		

SAP Rating	94 A	DER	16.03	TER	25.05
Environmental	89 B	% DER<TER	36.01		
CO ₂ Emissions (t/year)	0.71	DFEE	38.41	TFEE	43.48
General Requirements Compliance	Fail	% DFEE<TFEE	11.66		

Assessor Details	Mr. Dion Mellows, SHA Environmental Limited, Tel: 02036370427, info@shaenvironmental.co.uk	Assessor ID	G297-0001
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Client	
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SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

Orientation	North West
Property Tenure	Unknown
Transaction Type	None of the above
Terrain Type	Urban
1.0 Property Type	House, Semi-Detached
2.0 Number of Storeys	1
3.0 Date Built	2021
4.0 Sheltered Sides	3
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements				
	Ground Floor:	Heat Loss Perimeter 19.88 m	Internal Floor Area 64.74 m ²	Average Storey Height 2.62 m

7.0 Living Area	24.16	m ²
8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	188.55	kJ/m ² K

9.0 External Walls						
Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
External Wall	Cavity Wall	Cavity wall; dense plaster, lightweight aggregate block, filled cavity, any outside structure	0.18	140.00	17.71	15.23
Dormer Cheek	Steel Frame	Steel frame wall (warm frame or hybrid construction)	0.18	14.00	4.81	4.81
Dormer Frontal Face	Steel Frame	Steel frame wall (warm frame or hybrid construction)	0.18	14.00	35.58	18.43

9.1 Party Walls						
Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)	
Wall to Dwelling	Filled Cavity with Edge Sealing	Single plasterboard on dabs on both sides, dense blocks, cavity or cavity fill	0.00	70.00	50.28	

9.2 Internal Walls						
Description	Construction			Kappa (kJ/m ² K)	Area (m ²)	
Internal Wall	Plasterboard on timber frame			9.00	48.16	

10.0 External Roofs

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)



Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area (m²)	Nett Area (m²)
Flat HLR	External Flat Roof	Plasterboard, insulated flat roof	0.12	9.00	44.95	44.95
Dormer Flat Roof	External Flat Roof	Plasterboard, insulated flat roof	0.12	9.00	23.60	23.60

11.1 Party Floors

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor	Concrete floor slab, carpeted	80.00	64.74

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Window	BFRC data	Window	Double glazed			0.76			1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
SE1	Window	[1] External Wall	South East	Dark-coloured curtain or roller blind	0.00					2.48	50
SE2	Window	[3] Dormer Frontal Face	South East	Dark-coloured curtain or roller blind	0.00					6.00	50
SE3	Window	[3] Dormer Frontal Face	South East	Dark-coloured curtain or roller blind	0.00					2.15	50
SE4	Window	[3] Dormer Frontal Face	South East	Dark-coloured curtain or roller blind	0.00					4.50	50
SE5	Window	[3] Dormer Frontal Face	South East	Dark-coloured curtain or roller blind	0.00					4.50	50

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	
17.0 Thermal Bridging	Default	
Y-value	0.150	W/m²K
18.0 Pressure Testing	Yes	
Designed AP ₅₀	5.00	m³/(h.m²) @ 50 Pa
Property Tested ?		
As Built AP ₅₀		m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather	Windows fully open
Cross ventilation possible	No
Night Ventilation	No
Air change rate	4.00

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)



Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500029
Configuration	2
MVHR Duct Insulated	Yes
Manufacturer SFP	1.13
Duct Type	Rigid
MVHR Efficiency	89.00
Wet Rooms	2

20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				0
Number of passive vents				0
Number of flueless gas fires				0

21.0 Fixed Cooling System

No

22.0 Lighting

Internal

Total number of light fittings	25	
Total number of L.E.L. fittings	25	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted	No
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23.0 Electricity Tariff

24 Hour

24.0 Main Heating 1

Description	SAP table	
Percentage of Heat	Underfloor Electric Heating	
Main Heating	100	%
SAP Code	SEH	
Efficiency (SAP Table)	424	
Controls	100.0	%
Sap Code	CMD Time and temperature zone control	
	2706	

25.0 Main Heating 2

None

Community Heating	None
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28.0 Water Heating

Water Heating	HES Instantaneous at point of use
Flue Gas Heat Recovery System	Independent
Waste Water Heat Recovery	No
Instantaneous System 1	No

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)



Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
SAP Code	909

29.0 Hot Water Cylinder

32.0 Photovoltaic Unit

PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
1.20	South	30°	None Or Little	Yes

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

	Typical Cost	Typical savings per year	Ratings after improvement	
			SAP rating	Environmental Impact
Solar water heating	£4,000 - £6,000	£78	A 96	

BLOCK COMPLIANCE

Calculation Type: New Build (As Designed)



Block Reference	000122	Issued on Date	20/10/2021
Block Name	Proposed Case		
Assessor Details	Mr. Dion Mellows, SHA Environmental Limited, Tel: 02036370427, info@shaenvironmental.co.uk		Assessor ID
			G297-0001
Client			

Block Compliance Report - DER

Block Reference: 000122		Block Name: Proposed Case			
Property-Assessment Reference	Multiplier	Floor Area (m ²)	DER (kgCO ₂ /m ²)	TER (kgCO ₂ /m ²)	% DER/TER
210925-APARTMENT 3.01	1	64.74	16.03	25.05	36.01 %
210926-APARTMENT 3.02	1	64.74	16.03	25.05	36.01 %
210927-APARTMENT 3.03	1	64.74	17.43	28.29	38.40 %
210928-APARTMENT 3.04	1	64.74	17.43	28.29	38.40 %
Totals:	4	258.96	66.92	106.69	
Average DER = 16.73 kgCO ₂ /m ²		% DER/TER	PASS		
Average TER = 26.67 kgCO ₂ /m ²		37.27 %			

Block Compliance Report - DFEE

Block Reference: 000122		Block Name: Proposed Case			
Property-Assessment Reference	Multiplier	Floor Area (m ²)	DFEE (kWh/m ² /yr)	TFEE (kWh/m ² /yr)	% DFEE/TFEE
210925-APARTMENT 3.01	1	64.74	38.41	43.48	11.66 %
210926-APARTMENT 3.02	1	64.74	38.41	43.48	11.66 %
210927-APARTMENT 3.03	1	64.74	51.63	54.21	4.76 %
210928-APARTMENT 3.04	1	64.74	51.63	54.21	4.76 %
Totals:	4	258.96	180.08	195.39	
Average DFEE = 45.02 kWh/m ² /yr		% DFEE/TFEE	PASS		
Average TFEE = 48.85 kWh/m ² /yr		7.84 %			

DWELLING SIGN OFF REPORT



Section 1: Dwelling Information

Dwelling Address (Please confirm final postal address and post code of the dwelling.)

House Name		
House Number		
Postcode	UB7 7QR	
Street		
Locality		
Town		
County		

Dwelling Orientation North West (Please confirm orientation of main entrance door of the dwelling.)

Comments

Terrain Type Urban

Property Type House, Semi-Detached

Comments

Overshading (called Sunlight/shade in assessment) Average or unknown

Comments

Section 2: Dwelling Construction Details

Thermal Mass Parameter Precise calculation

Thermal Mass 188.55 kJ/m²K

Comments

External Walls

Type	Cavity Wall		
Construction	Cavity wall; dense plaster, lightweight aggregate block, filled cavity, any outside structure		
U-value	0.18	W/m ² K	U-value calculations should be provided to verify the u-value entered in the survey.
Gross Area	17.71	m ²	
Type	Steel Frame		
Construction	Steel frame wall (warm frame or hybrid construction)		
U-value	0.18	W/m ² K	U-value calculations should be provided to verify the u-value entered in the survey.
Gross Area	4.81	m ²	
Type	Steel Frame		
Construction	Steel frame wall (warm frame or hybrid construction)		
U-value	0.18	W/m ² K	U-value calculations should be provided to verify the u-value entered in the survey.
Gross Area	35.58	m ²	

Comments

Party Walls

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Type	Construction	U-Value (W/m²K)	Area (m²)
Filled Cavity with Edge Sealing	Single plasterboard on dabs on both sides, dense blocks, cavity or cavity fill	0.00	50.28
Comments			

External Roofs

Type	External Flat Roof		
Construction	Plasterboard, insulated flat roof		
U-value	0.12	W/m²K	U-value calculations should be provided to verify the u-value entered in the survey.
Gross Area	44.95	m²	
Type	External Flat Roof		
Construction	Plasterboard, insulated flat roof		
U-value	0.12	W/m²K	U-value calculations should be provided to verify the u-value entered in the survey.
Gross Area	23.60	m²	

Comments

Opening Types

Description	Type	Glazing	Frame Type	U Value (W/m²K)
Window	Window	Double glazed		1.20
Comments				

Openings

Name	Opening Type	Location	Orientation	Area (m²)
SE1	Window	[1] External Wall	South East	2.48
SE2	Window	[3] Dormer Frontal Face	South East	6.00
SE3	Window	[3] Dormer Frontal Face	South East	2.15
SE4	Window	[3] Dormer Frontal Face	South East	4.50
SE5	Window	[3] Dormer Frontal Face	South East	4.50

Comments

Thermal Bridging

	Default	
Y-value	0.150	W/m²K
Comments		

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Where specific construction details have been used documentary evidence should be provided to the SAP assessor, usually in the form of signed checklists.

Pressure Testing

Yes

As Built AP₅₀

m³/(h.m²) @ 50 Pa

Where an air pressure test has been carried out a copy of the test certificate should be forwarded to the SAP assessor.

Comments

Section 3: Dwelling Systems

Mechanical Ventilation

Type Balanced mechanical ventilation with heat recovery

Brand Model Nuaire MRXBOX90L

SFP 1.13

Efficiency 89.00

Duct Type Rigid

Duct Brand Model

Number of Wet Rooms

2

Comments

Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				0
Number of passive vents				0
Number of flueless gas fires				0

Comments

Internal Lighting

Total number of light fittings 25

Total number of L.E.L. fittings 25

Percentage of L.E.L. fittings 100.00 %

Comments

External Lighting

External lights fitted No

Comments

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Electricity Tariff	24 Hour
Comments	

Main Heating 1	SAP table
Fuel Type	electricity
Main Heating	Electricity SEH Underfloor heating in thin screed (standard tariff)
Efficiency (SAP Table)	100.0 %
Brand, Model	
Flue Type	
Fan Assisted Flue	
Heat Emitter	
Flow Temperature	
Comments	

Heating Controls

Description	CMD Time and temperature zone control
Boiler Interlock	
Delayed Start Stat	
Compensator	
Comments	

Main Heating 2	None
Comments	

Water Heating System	HES Instantaneous at point of use
Water Heating	Independent
Supplementary Immersion	
Comments	

Section 4: Dwelling Renewable Energy

Photovoltaic Panels	One Dwelling			
PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
1.20	South	30°	None Or Little	Yes
MCS Certificate available?				

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Comments

Section 5: Declaration

I confirm that all details provided above are accurate to the best of my knowledge.

Signed

Date