Sustainability Statement

Wood Walk, Hoyland, Barnsley

Presented to **Yelcon Ltd**

Issued: August 2021

Delta-Simons Project No. 16-0406.09

deltasimons

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Report Details

Client	Yelcon Ltd
Report Title	Sustainability Statement
Site Address	Wood Walk, Hoyland, Barnsley
Project No.	16-0406.09
Delta-Simons Contact	Rob Molyneux (Rob.Molyneux@deltasimons.com)

Quality Assurance

Issue No.	Status	Issue Date	Comments	Author	Review	Authorised
1	Final	19th August 2021	-			
				Rob Molyneux Unit Director	**Tim Mawby Consultant**	**Gaston Senese Senior Consultant**

About us

Delta-Simons is a trusted, multidisciplinary environmental consultancy, focused on delivering the best possible project outcomes for customers.

Specialising in Environment, Health & Safety and Sustainability, Delta-Simons provide support and advice within the property development, asset management, corporate and industrial markets. Operating from across the UK we employ over 120 environmental professionals, bringing experience from across the private consultancy and public sector markets.

As part of Lucion Services, our combined team of 500 in the UK has a range of specialist skill sets in over 50 environmental consultancy specialisms including asbestos, hazardous materials, ecology, air and water services, geo-environmental and sustainability amongst others.

Delta-Simons is proud to be a founder member of the Inogen Environmental Alliance, enabling us to efficiently deliver customer projects worldwide by calling upon over 5000 resources in our global network of consultants, each committed to providing superior EH&S and sustainability consulting expertise to our customers. Inogen Environmental Alliance offers its clients more consultants, with more services in more countries than the traditional multinational consultancy.

Delta-Simons is a '***Beyond Net-Zero'*** company. We have set a Science-Based Target to reduce our Scope 1 and Scope 2 carbon emissions in line with the Paris Agreement and are committed to reducing Scope 3 emissions from our supply chain. Every year we offset our residual emissions by 150% through verified carbon removal projects linked to the UN Sustainable Development Goals.

Therefore, our consultancy services to you are climate positive. If you would like support in calculating your carbon footprint and playing your part in tackling the global climate crisis, please get in touch with your Delta-Simons contact above who will be happy to help.

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Appendices

1.0 Introduction

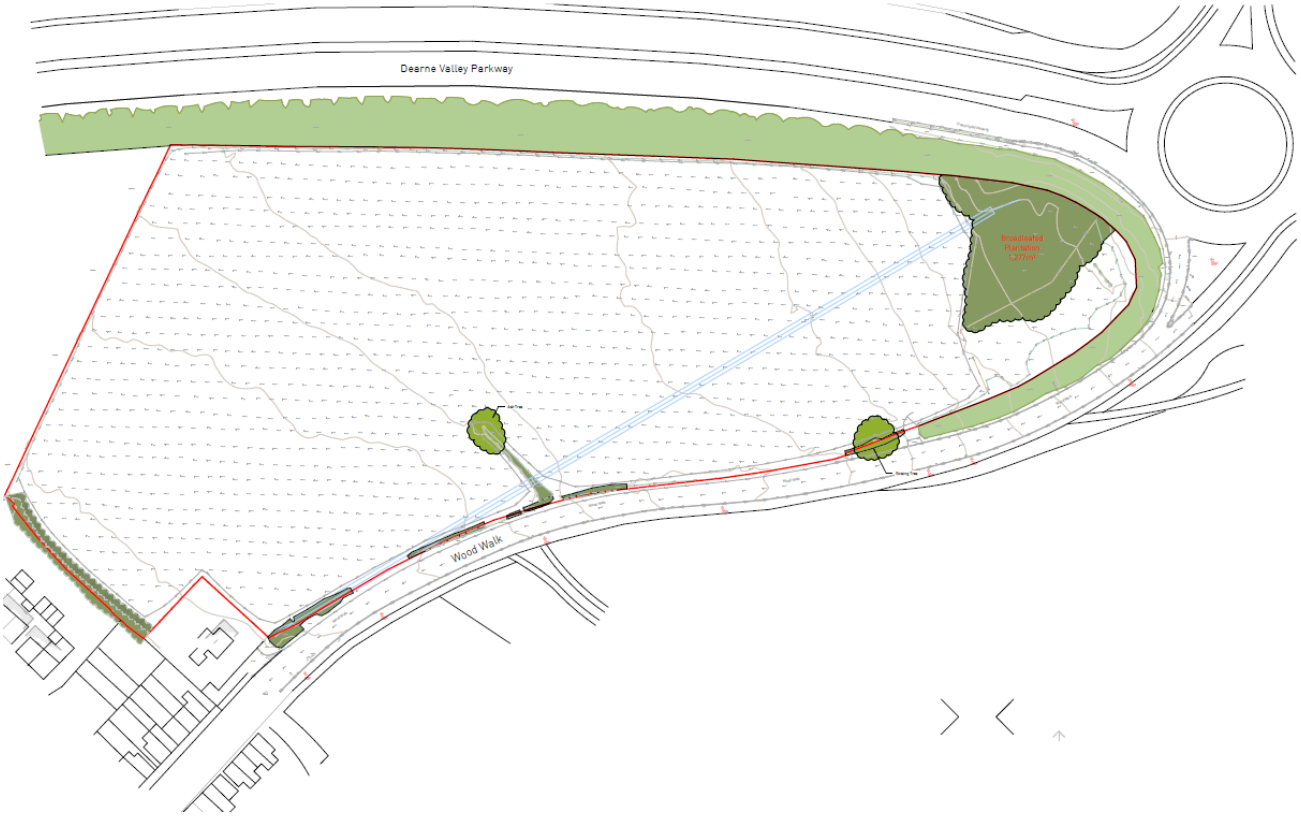
1.1 Appointment

1.1.1 Delta-Simons Environmental Consultants Ltd ("Delta-Simons") was instructed by Yelcon Ltd ("the Client") to provide a Sustainability Statement for Land to the north of Wood Walk, Hoyland, Barnsley (the "Site") to inform a planning application for the development of the Site to include 84no. dwellings.

1.2 Site Location and Context

1.2.1 The Proposed Development considers the construction of 84no. residential dwellings at the site, which is located to the north of Wood Walk and to the south of Dearne Valley Parkway, Barnsley. Figure 1, below, sets out the site location plan.

Figure 1. Site Location Plan



1.2.2 Figure 2, below, sets out the Site Plan for the Proposed Development, incorporating variations around 11 dwelling types.

Figure 2. Proposed Site Plan

2.0 National Planning Policy

2.1 General Commentary

2.1.1 The relevant planning and dedicated sustainability policy documents that promote themes of sustainable development have been summarised below. The following policies are applicable to the proposed Site and form the basis of Delta-Simons' Energy and Sustainability Statement.

2.1.2 No specific targets in relation to energy demand, energy efficiency or greenhouse gas emissions are currently stipulated through national policy.

2.2 National Planning Policy Framework (NPPF)

2.2.1 The Government first published the NPPF in March 2012 and was updated in July 2018, February 2019 and July 2021. At the time of issue of this report, current supporting national planning policy guidance (NPPG) has yet to be updated to reflect the revised NPPF of July 2021 but remains relevant. Together, the NPPF and NPPG set out what the Government expects of local authorities. The overall aim is to ensure the planning system allows land to be used for new homes and jobs, while protecting valuable natural and historic environments.

2.2.2 The NPPF outlines the Government's planning policies for England. It provides a framework within which local people and accountable councils can produce their own distinctive local plan which reflect the needs and priorities of their neighbourhoods and communities. The purpose of the NPPF is to contribute to the achievement of sustainable development.

2.2.3 The NPPF aims to strengthen local decision making as a way to foster the delivery of sustainable developments. However, the NPPF also outlines that sustainable developments require careful attention to viability and costs in plan-making and decision-taking processes. Over everything else, plans should be deliverable. Therefore, the sites and scale of development within the plan should not be subjected to large scale obligations and burdens, so that their ability to be developed viably is threatened.

2.2.4 The NPPF guidance promotes planning for climate change. Chapter 14 of the NPPF, Meeting the Challenge of Climate Change, Flooding and Coastal Change (paragraphs 153 to 158) states that:

Plans should take a proactive approach to mitigating and adapting to climate change, taking into account the long-term implications for flood risk, coastal change, water supply, biodiversity and landscapes, and the risk of overheating from rising temperatures. Policies should support appropriate measures to ensure the future resilience of communities and infrastructure to climate change impacts, such as providing space for physical protection measures, or making provision for the possible future relocation of vulnerable development and infrastructure.

New development should be planned for in ways that:

- *Avoid increased vulnerability to the range of impacts arising from climate change. When new development is brought forward in areas which are vulnerable, care should be taken to ensure that risks can be managed through suitable adaptation measures, including through the planning of green infrastructure; and*
- *Can help to reduce greenhouse gas emissions, such as through its location, orientation and design. Any local requirements for the sustainability of buildings should reflect the Government's policy for national technical standards.*

To help increase the use and supply of renewable and low carbon energy and heat, plans should:

- *Provide a positive strategy for energy from these sources, that maximises the potential for suitable development, while ensuring that adverse impacts are addressed satisfactorily (including cumulative landscape and visual impacts).*

- *Consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure their development; and*
- *Identify opportunities for development to draw its energy supply from decentralised, renewable or low carbon energy supply systems and for co-locating potential heat customers and suppliers.*

Local planning authorities should support community-led initiatives for renewable and low carbon energy, including developments outside areas identified in local plans or other strategic policies that are being taken forward through neighbourhood planning.

In determining planning applications, local planning authorities should expect new development to:

a) Comply with any development plan policies on local requirements for decentralised energy supply unless it can be demonstrated by the applicant, having regard to the type of development involved and its design, that this is not feasible or viable; and

b) Take account of landform, layout, building orientation, massing and landscaping to minimise energy consumption.

When determining planning applications for renewable and low carbon development, local planning authorities should:

a) Not require applicants to demonstrate the overall need for renewable or low carbon energy, and recognise that even small-scale projects provide a valuable contribution to cutting greenhouse gas emissions; and

b) Approve the application if its impacts are (or can be made) acceptable. Once suitable areas for renewable and low carbon energy have been identified in plans, local planning authorities should expect subsequent applications for commercial scale projects outside these areas to demonstrate that the proposed location meets the criteria used in identifying suitable areas.

3.0 Summary of Local Planning Policy Requirements

3.1 Current Local Planning Policy – Barnsley Local Plan

3.1.1 Barnsley Local Plan was adopted by Barnsley Metropolitan Borough Council in January 2019.

3.1.2 Section 19 of the Barnsley Local Plan addresses the Council's approach to Climate Change within which, Policies CC1 and CC2 address climate change and sustainable design and construction, respectively.

Policy CC1 – Climate Change

We will seek to reduce the causes of and adapt to the future impacts of climate change by:

- *Promoting the reduction of greenhouse gas emissions through sustainable design and construction techniques;*
- *Locating and designing development to reduce the risk of flooding;*
- *Promoting the use of Sustainable Draining Systems (SuDS);*
- *Promoting and supporting the delivery of renewable and low carbon energy; and*
- *Promoting investment in Green Infrastructure to promote and encourage biodiversity gain.*

Policy CC2 – Sustainable Design & Construction

Development will be expected to minimise resource and energy consumption through the inclusion of sustainable design and construction features, where this is technically feasible and viable.

All non-residential development will be expected, to achieve a minimum standard of BREEAM 'Very Good' (or any future national equivalent). This should be supported by preliminary assessments at planning application stage.

3.1.3 Policy CC1 and Policy CC2 refer to promoting the reduction of greenhouse gas emissions and resource and energy consumption through sustainable design. No specific target for GHG emissions reduction is stated within the planning policy.

3.1.4 Policy CC1 refers to promotion of renewable and low carbon energy. No specific target for contributions from renewable energy sources is stated within the planning policy.

3.1.5 Current national planning policy does not include for any formal definitions or targets for zero carbon development or definitions of allowable solutions and refers only to principles of sustainable design in developments. Energy and carbon emission targets are defined only by current Building Regulations Approved Document ADL2A 2013 Edition (incorporating 2016 amendments).

3.1.6 Paragraph 19.4 of the Local Plan states *"For housing developments, energy efficiency is regulated by Building Regulations. We will encourage energy efficiency that exceeds those minimum standards set out in national standards and take that into account where proposed in support of a planning application."*.

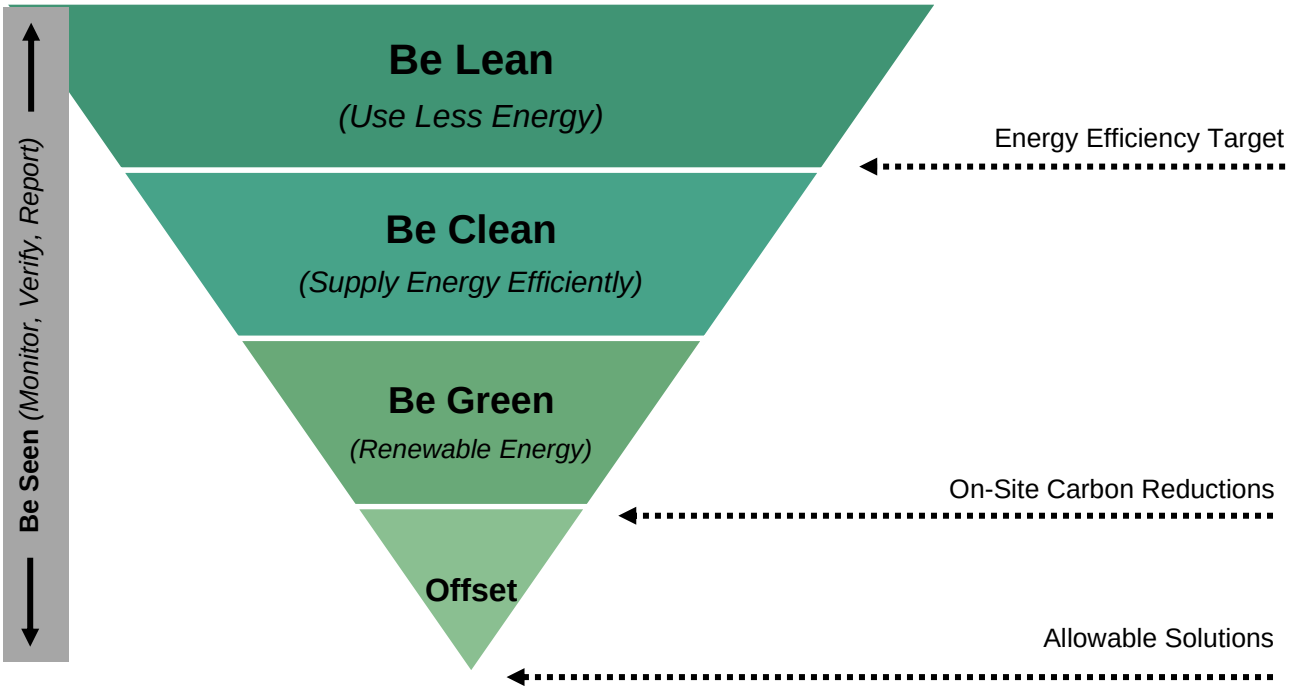
4.0 Energy Statement

4.1 The Energy Hierarchy

4.1.1 The energy hierarchy is generally accepted as the most effective way of reducing building carbon emissions. This is highlighted and recognised in the energy hierarchy;

1. **Be Lean:** use less energy
2. **Be Clean**: supply energy efficiently
3. **Be Green:** use renewable energy
4. **Be Seen:** monitor, verify and report on energy performance

Figure 3. The Energy Hierarchy



4.1.2 **Reducing Energy Demand:** The first step in the process of reducing the overall energy used and CO_2 produced by the building is to minimise the energy required to heat it. A well-insulated building envelope and passive design will reduce the energy requirement for heating and ventilating the building.

4.1.3 **Energy Efficient Systems:** The second step is to specify services and controls, lighting and appliances that are energy efficient and which result in further reduction in energy requirements.

4.1.4 **Supply Energy Efficiently:** Beyond reduction in energy demand, the supply of clean energy can help to reduce the impact of a proposed development. This can include the use of combined heat and power (CHP) for heating and hot water or connection to a local heat network.

4.1.5 **Making Use of Low or Zero-carbon (LZC) Technologies:** When the energy demand has been reduced by implementing the processes of improving the fabric and energy efficiency, then LZC technologies can be employed to reduce the environmental impact of the remaining energy consumption.

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

4.2 Be Lean – Use Less Energy (Building Fabric Specification)

4.2.1 The proposed development includes 84no. residential dwellings, formed of variations of 11no. house type designs, including a mix of detached, semi-detached and mid-terrace houses, and ground floor and top floor flats.

4.2.2 The Proposed Development is to be constructed in accordance with design specification sufficient to satisfy Building Regulations through a "fabric first" approach, maximising thermal performance of the building envelope, without reliance on the use of additional "bolt on" energy efficiency measures in the building services design, or through the use of additional renewable energy solutions.

4.2.3 All building fabric specifications have been provided to Delta-Simons by the Client.

4.2.4 Table 1, below, sets out the standard design specification for the house types, against minimum performance standards allowable within Building Regulations Approved Document ADL1A.

Table 1. Be Lean – Building Fabric Specification

Element Type	Proposed Construction	ADL1A Limit
External Walls	0.27 W/m^{2}K	0.30 W/m^{2}K
Party Walls	0.00 W/m^{2}K	-
Ground Floor	0.14 W/m^{2}K	0.25 W/m^{2}K
Roof	0.11 W/m^{2}K	0.25 W/m^{2}K
Window	1.30 W/m^{2}K	2.20 W/m^{2}K
Air Tightness	5 m^3/hr.m^2	10 m^3/hr.m^2

4.2.5 In order to achieve compliance with Building Regulations, dwelling types J and K (ground and top floor flats) require marginal betterment over the general specification, with air tightness intended to be improved to 3 m^3/hr.m^2

4.2.6 The performance of the building fabric specification can be established through review of Dwelling Fabric Energy Efficiency (DFEE) against Target Fabric Energy Efficiency (TFEE). Table 2, below, sets out DFEE and TFEE for each dwelling type.

Table 2. Be Lean – Building Fabric Specification

Dwelling Type	DFEE (kWh/m^2)	TFEE (kWh/m^2)
Type A	51.8	56.3
Type B	49.7	55.8
Type C	58.9	65.7
Type D	51.5	58.6
Type E	56.5	63.7
Type F	53.0	58.4
Type G	55.5	59.9
Type H (Mid plot)	46.7	53.7

Type H (End plot)	56.6	63.4
Type J (Mid plot)	DFEE and TFEE not available for these dwelling types	
Type J (End plot)		
Type K (Mid plot)		
Type K (End plot)		
Type L	58.1	64.5

4.3 Be Lean – Use Less Energy (Building Services Specification)

4.3.1 All building services specifications have provided to Delta-Simons by the Client.

4.3.2 The building services performance specifications provided by the Client is set out in Table 3, below.

Table 3. Internal Services Specification

Specification Element	Proposed Specification
Main Heating System	Worcester Greenstar 36CDi Compact ErP (Combi) (89.8%) or equivalent
Secondary Heating	None
Hot Water Storage	None (combi)
Boiler Interlock	Yes
Fixed Lighting	100% low energy fittings
Mechanical Ventilation	None

4.3.3 In order to achieve compliance with Building Regulations, dwelling types J and K (ground and top floor flats) require marginal betterment over the general specification, with inclusion of Whole House Mechanical Ventilation with Heat Recovery (MVHR).

4.4 Be Clean – Supply Energy Efficiently

4.4.1 No allowance has been made in the original construction for development of a decentralised heat network at the site.

4.4.2 Combined Heat and Power (CHP) is not considered technically viable due to the heat and power demand profiles of the building.

4.5 Be Green – Renewable Energy

4.5.1 No allowance has been made for inclusion of renewable energy systems to achieve compliance with Building Regulations and planning policy requirements.

4.5.2 By considering a fabric first approach to design, without the requirement to rely upon renewable energy, the dwellings are constructed to reduce energy demand, and allow for future adaptation to incorporate additional features, such as renewable energy solutions if appropriate to the needs of the occupant or property owner.

4.6 Carbon Emissions (Dwelling Emission Rate – DER)

4.6.1 A calculation of the Dwelling Emission Rate (DER) for the house types across the Proposed Development has been included within the energy modelling undertaken for the Site.

4.6.2 Table 4, below, sets out the DER against the Target Emission Rate (TER).

Table 4. DER vs TER

Dwelling Type	DER ($kgCO_2/m^2$)	TER ($kgCO_2/m^2$)
Type A	19.42	19.69
Type B	18.74	18.84
Type C	18.47	19.14
Type D	17.23	17.23
Type E	17.69	17.93
Type F	17.31	17.62
Type G	18.52	19.03
Type H (Mid plot)	18.32	19.39
Type H (End plot)	20.28	21.16
Type J (Mid plot)	18.41	19.09
Type J (End plot)	20.97	21.75
Type K (Mid plot)	16.95	16.96
Type K (End plot)	16.46	18.28
Type L	17.76	18.25

4.6.3 As demonstrated from calculations provided, the proposed design specification for thermal elements and fixed internal services is sufficient to demonstrate compliance with the requirements of Building Regulations and local planning policy.

5.0 Conclusion

5.0.1 The Proposed Development includes 84no. new residential dwellings located on land north of Wood Walk, Barnsley.

5.0.2 A sustainable approach to design, focused on “fabric first”, “be lean” commitment to reducing energy demand from the dwellings, satisfies the requirements of Building Regulations compliance and planning policy requirements, while allowing for the properties to be adaptable for future incorporation of renewable energy systems.

5.0.3 Dwelling Fabric Energy Efficiency (DFEE) and Dwelling Emission Rates (DER) for all dwelling types within the proposed development are shown to be compliant with the requirements of Building Regulations.

Appendix A – SAP Calculation Sheets

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.17
Printed on 18 April 2019 at 14:29:12

Project Information:

Assessed By: Jodie Evans (STRO006643) **Building Type:** End-terrace House

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 71.38m²

Site Reference : Phase 4 - Yeadon **Plot Reference:** House Type A - Plot 47 and 50

Address : House Type A, Plot 47 and 50, Green Lane , Rawdon, na

Client Details:

Name: Scotfield Group

Address : C/O Enjoy Design

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

1a TER and DER

Fuel for main heating system: Mains gas
Fuel factor: 1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER)	19.69 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	19.42 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	56.3 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	51.8 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.27 (max. 0.30)	0.27 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	0.14 (max. 0.25)	0.14 (max. 0.70)	**OK**
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	**OK**
Openings	1.30 (max. 2.00)	1.30 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main Heating system:	Database: (rev 441, product index 017515): Boiler systems with radiators or underfloor heating - mains gas Brand name: Worcester Model: Greenstar Model qualifier: 36CDi Compact ErP (Combi) Efficiency 89.8 % SEDBUK2009 Minimum 88.0 %	**OK**
Secondary heating system:	None	

Regulations Compliance Report

5 Cylinder insulation

Hot water Storage:	No cylinder	

6 Controls

Space heating controls	TTZC by plumbing and electrical services	**OK**
Hot water controls:	No cylinder	
	No cylinder	
Boiler interlock:	Yes	**OK**

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (East Pennines):	Not significant	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: South East	4.58m²
Windows facing: South West	0.73m²
Windows facing: North West	6.72m²
Ventilation rate:	4.00
Blinds/curtains:	None

10 Key features

Roofs U-value	0.11 W/m²K
Party Walls U-value	0 W/m²K

SAP Input

Property Details: House Type A - Plot 47 and 50

Address:	House Type A, Plot 47 and 50, Green Lane , Rawdon, na
Located in:	England
Region:	East Pennines
UPRN:	
Date of assessment:	18 April 2019
Date of certificate:	18 April 2019
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Calculated 194.61
Water use <= 125 litres/person/day:	True
PCDF Version:	441

Property description:

Dwelling type:	House
Detachment:	End-terrace
Year Completed:	2019

Floor Location:	Floor area:	Storey height:
Floor 0	35.69 m²	2.43 m
Floor 1	35.69 m²	2.79 m

Living area:	16.75 m² (fraction 0.185)
Front of dwelling faces:	South East

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
Front door	Manufacturer	Half glazed	low-E, En = 0.05, soft coat	No	PVC-U
Front windows	SAP 2012	Windows	low-E, En = 0.05, soft coat	No	PVC-U
Side windows	SAP 2012	Windows	low-E, En = 0.05, soft coat	No	PVC-U
Rear windows	SAP 2012	Windows	low-E, En = 0.05, soft coat	No	PVC-U

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
Front door	16mm or more mm	0.7	0.63	1.3	2.15	1
Front windows	16mm or more	0.7	0.63	1.3	4.58	1
Side windows	16mm or more	0.7	0.63	1.3	0.73	1
Rear windows	16mm or more	0.7	0.63	1.3	6.72	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
Front door		External wall	South East	0	0
Front windows		External wall	South East	0	0
Side windows		External wall	South West	0	0
Rear windows		External wall	North West	0	0

Overshading:	Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External wall	88.9	14.18	74.72	0.27	0	False	60
Plane roof	35.69	0	35.69	0.11	0		9
Ground floor	35.69			0.14			75
Internal Elements							
stud	129.87						9
ceiling	35.69						9

SAP Input

floor	35.69	18
Party Elements		
Party wall	38.89	110

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0482

	Length	Psi-value		
	9.766	0.051	E2	Other lintels (including other steel lintels)
	7.383	0.016	E3	Sill
	22.97	0.015	E4	Jamb
[Approved]	17.03	0.16	E5	Ground floor (normal)
	17.03	-0.007	E6	Intermediate floor within a dwelling
	7.45	0.087	E12	Gable (insulation at ceiling level)
	10.44	0.057	E16	Corner (normal)
	9.58	0.039	E10	Eaves (insulation at ceiling level)
[Approved]	10.44	0.06	E18	Party wall between dwellings
	7.45	0.16	P1	Ground floor
	7.45	0	P2	Intermediate floor within a dwelling
	7.45	0.098	P4	Roof (insulation at ceiling level)

Ventilation:

Pressure test: Yes (As designed)
Ventilation: Natural ventilation (extract fans)
Number of chimneys: 0
Number of open flues: 0
Number of fans: 3
Number of passive stacks: 0
Number of sides sheltered: 1
Pressure test: 5

Main heating system:

Main heating system:
Boiler systems with radiators or underfloor heating
Gas boilers and oil boilers
Fuel: mains gas
Info Source: Boiler Database
Database: (rev 441, product index 017515) Efficiency: Winter 87.0 % Summer: 90.7
Brand name: Worcester
Model: Greenstar
Model qualifier: 36CDi Compact ErP
(Combi boiler)
Systems with radiators
Central heating pump : 2013 or later
Design flow temperature: Unknown
Boiler interlock: Yes
Delayed start

Main heating Control:

Main heating Control:
Time and temperature zone control by suitable arrangement of plumbing and electrical services
Control code: 2110

Secondary heating system:

Secondary heating system: None

Water heating:

Water heating:
From main heating system
Water code: 901
Fuel :mains gas
No hot water cylinder

SAP Input

Solar panel: False

Others:

Electricity tariff:	Standard Tariff
In Smoke Control Area:	Unknown
Conservatory:	No conservatory
Low energy lights:	100%
Terrain type:	Low rise urban / suburban
EPC language:	English
Wind turbine:	No
Photovoltaics:	None
Assess Zero Carbon Home:	No

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 18 April 2019

Property Details: House Type A - Plot 47 and 50

Dwelling type:	End-terrace House
Located in:	England
Region:	East Pennines
Cross ventilation possible:	Yes
Number of storeys:	2
Front of dwelling faces:	South East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Calculated 194.61
Night ventilation:	False
Blinds, curtains, shutters:	None
Ventilation rate during hot weather (ach):	4 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	245.92	**(P1)**
Transmission heat loss coefficient:	54.5	
Summer heat loss coefficient:	300.41	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
South East (Front windows)	0	1
South West (Side windows)	0	1
North West (Rear windows)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
South East (Front windows)	1	0.9	1	0.9	**(P8)**
South West (Side windows)	1	0.9	1	0.9	**(P8)**
North West (Rear windows)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation	**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
South East (Front windows)	0.9 x 4.58	113.91	0.63	0.7	0.9	186.36	
South West (Side windows)	0.9 x 0.73	113.91	0.63	0.7	0.9	29.7	
North West (Rear windows)	0.9 x 6.72	91.1	0.63	0.7	0.9	218.68	
					Total	434.75	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	402.43	386	393.67	
Total summer gains	860.3	820.74	766.01	**(P5)**
Summer gain/loss ratio	2.86	2.73	2.55	**(P6)**
Mean summer external temperature (East Pennines)	14.6	16.6	16.4	
Thermal mass temperature increment	0.64	0.64	0.64	
Threshold temperature	18.1	19.97	19.59	**(P7)**
Likelihood of high internal temperature	**Not significant**	**Not significant**	**Not significant**	

Assessment of likelihood of high internal temperature: Not significant

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

Property Reference	HD8 8DY Plot 6	**Issued on Date**	13/04/2021
Assessment Reference	001	**Prop Type Ref**	Type Lilac End/Semi
Property	Plot 6, Abbey Road, Shepley, Huddersfield, HD8 8DY		

SAP Rating	83 B	**DER**	18.74	**TER**	18.84
Environmental	85 B	**% DER<TER**	0.52		
CO_2 Emissions (t/year)	1.54	**DFEE**	49.68	**TFEE**	55.84
General Requirements Compliance	Pass	**% DFEE<TFEE**	11.02		

Assessor Details	Mr. Jake Eaton, Jake Eaton, Tel: 01400283471, jake@aeratech.co.uk	**Assessor ID**	P711-0001
Client			

Regs Region: England
Elmhurst Energy Systems SAP2012 Calculator (Design System) version 4.14r16

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

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

DWELLING AS DESIGNED

Semi-Detached House, total floor area 84 m²

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

1a TER and DER
Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 18.84 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 18.74 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)55.8 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)49.7 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.25 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.11 (max. 0.25)	0.11 (max. 0.70)	OK
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	OK
Openings	1.30 (max. 2.00)	1.30 (max. 3.30)	OK

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

3 Air permeability
Air permeability at 50 pascals: 5.00 (design value)
Maximum 10.0 OK

4 Heating efficiency
Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from manufacturer
rated a
Combi boiler
Efficiency: 90%
Minimum: 88% OK

Secondary heating system: None

5 Cylinder insulation
Hot water storage: No cylinder

6 Controls
Space heating controls: Time and temperature zone control OK

Hot water controls: No cylinder

Boiler interlock: Yes OK

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

8 Mechanical ventilation
Not applicable

9 Summertime temperature
Overheating risk (East Pennines): Slight OK
Based on:
Overshading: Average
Windows facing East: 4.97 m², No overhang
Windows facing South: 0.73 m², No overhang
Windows facing West: 8.90 m², No overhang
Air change rate: 2.50 ach
Blinds/curtains: Light-coloured curtain or roller blind, closed 50% of daylight hours

10 Key features
Party wall U-value 0.00 W/m²K
Roof U-value 0.11 W/m²K
Floor U-value 0.11 W/m²K

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	41.8800 (1b)	x	2.4400 (2b)	=	102.1872	(1b) - (3b)
First floor	41.8800 (1c)	x	2.8000 (2c)	=	117.2640	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	83.7600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	219.4512	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							4 * 10 =	40.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1823	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.4323	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3674	(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	0.4685	0.4593	0.4501	0.4042	0.3950	0.3491	0.3491	0.3399	0.3674	0.3950	0.4134	0.4317	(22b)
Effective ac	0.6097	0.6055	0.6013	0.5817	0.5780	0.5609	0.5609	0.5578	0.5675	0.5780	0.5854	0.5932	(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	
Opening Type 1			1.8900	1.3000	2.4570			(26a)
Opening Type 2 (Uw = 1.30)			14.6000	1.2357	18.0418			(27)
Heat Loss Floor 1			41.8800	0.1100	4.6068	75.0000	3141.0000	(28a)
External Wall 1	105.0600	16.4900	88.5700	0.2500	22.1425	60.0000	5314.2000	(29a)
External Roof 1	41.8800		41.8800	0.1100	4.6068	9.0000	376.9200	(30)
Total net area of external elements Aum(A, m2)			188.8200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		51.8549			(33)
Party Wall 1			45.3300	0.0000	0.0000	70.0000	3173.1000	(32)
Internal Wall 1			106.8700			9.0000	961.8300	(32c)
Internal Floor 1			41.8800			18.0000	753.8400	(32d)
Internal Ceiling 1			41.8800			18.0000	753.8400	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		14474.7300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							172.8120	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.9544	(36)
Total fabric heat loss					(33) + (36) =		65.8094	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	44.1563	43.8477	43.5453	42.1245	41.8587	40.6213	40.6213	40.3922	41.0979	41.8587	42.3965	42.9586	(38)
Heat transfer coeff	109.9657	109.6571	109.3546	107.9339	107.6681	106.4307	106.4307	106.2015	106.9073	107.6681	108.2058	108.7680	(39)
Average = Sum(39)m / 12 =												107.9326	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3129	1.3092	1.3056	1.2886	1.2854	1.2707	1.2707	1.2679	1.2764	1.2854	1.2919	1.2986	(40)
HLP (average)												1.2886	(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	2.5303	(42)
Average daily hot water use (litres/day)	94.2957	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	103.7252	99.9534	96.1816	92.4097	88.6379	84.8661	84.8661	88.6379	92.4097	96.1816	99.9534	103.7252	(44)
Energy conte	153.8215	134.5333	138.8263	121.0321	116.1332	100.2141	92.8631	106.5618	107.8345	125.6707	137.1794	148.9679	(45)
Energy content (annual)										Total = Sum(45)m =		1483.6379	(45)

Distribution loss (46)m = 0.15 x (45)m

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	23.0732	20.1800	20.8239	18.1548	17.4200	15.0321	13.9295	15.9843	16.1752	18.8506	20.5769	22.3452	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	50.9589	46.0059	49.0131	45.5719	45.1689	41.8518	43.2468	45.1689	45.5719	49.0131	49.2921	50.9589	(61)
Total heat required for water heating calculated for each month													
	204.7804	180.5392	187.8394	166.6041	161.3021	142.0659	136.1099	151.7307	153.4064	174.6838	186.4715	199.9268	(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													
	204.7804	180.5392	187.8394	166.6041	161.3021	142.0659	136.1099	151.7307	153.4064	174.6838	186.4715	199.9268	(64)
								Total per year (kWh/year) = Sum(64)m =				2045.4602	(64)
Heat gains from water heating, kWh/month													
	63.8854	56.2338	58.4130	51.6362	49.9065	43.7841	41.6887	46.7240	47.2479	54.0388	57.9352	62.2716	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	126.5172	126.5172	126.5172	126.5172	126.5172	126.5172	126.5172	126.5172	126.5172	126.5172	126.5172	126.5172	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	20.5651	18.2657	14.8547	11.2460	8.4065	7.0971	7.6687	9.9680	13.3791	16.9878	19.8273	21.1367	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	227.1192	229.4759	223.5369	210.8934	194.9333	179.9330	169.9119	167.5552	173.4942	186.1377	202.0978	217.0981	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.6517	35.6517	35.6517	35.6517	35.6517	35.6517	35.6517	35.6517	35.6517	35.6517	35.6517	35.6517	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	(71)
Water heating gains (Table 5)													
	85.8674	83.6813	78.5121	71.7169	67.0787	60.8113	56.0332	62.8011	65.6221	72.6328	80.4655	83.6983	(72)
Total internal gains													
	397.5068	395.3781	380.8589	357.8114	334.3736	311.7966	297.5690	304.2795	316.4506	339.7134	366.3457	385.8882	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9700	19.6403	0.7600	0.7500	0.7700	38.5578	(76)
South	0.7300	46.7521	0.7600	0.7500	0.7700	13.4813	(78)
West	8.9000	19.6403	0.7600	0.7500	0.7700	69.0471	(80)

Solar gains	121.0862	232.5768	374.7847	537.3700	652.7350	666.1594	635.0085	548.9560	432.5595	273.5877	150.1505	100.1381	(83)
Total gains	518.5930	627.9549	755.6436	895.1814	987.1086	977.9560	932.5775	853.2355	749.0101	613.3011	516.4963	486.0263	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	36.5638	36.6667	36.7681	37.2520	37.3440	37.7782	37.7782	37.8597	37.6098	37.3440	37.1584	36.9664	
alpha	3.4376	3.4444	3.4512	3.4835	3.4896	3.5185	3.5185	3.5240	3.5073	3.4896	3.4772	3.4644	
util living area													
	0.9907	0.9815	0.9579	0.8966	0.7828	0.6229	0.4790	0.5353	0.7722	0.9407	0.9839	0.9925	(86)
MIT	19.1122	19.3584	19.7679	20.2775	20.6716	20.8963	20.9688	20.9541	20.7707	20.2203	19.5716	19.0740	(87)
Th 2	19.8308	19.8336	19.8365	19.8498	19.8523	19.8639	19.8639	19.8660	19.8594	19.8523	19.8472	19.8420	(88)
util rest of house													
	0.9884	0.9770	0.9474	0.8706	0.7296	0.5354	0.3652	0.4184	0.6966	0.9202	0.9792	0.9907	(89)
MIT 2	17.3321	17.6910	18.2816	19.0036	19.5208	19.7865	19.8495	19.8427	19.6613	18.9438	18.0121	17.2834	(90)
Living area fraction										fLA = Living area / (4) =		0.2059	(91)
MIT	17.6987	18.0344	18.5877	19.2659	19.7578	20.0151	20.0800	20.0716	19.8898	19.2067	18.3333	17.6522	(92)
Temperature adjustment												-0.1500	
adjusted MIT	17.5487	17.8844	18.4377	19.1159	19.6078	19.8651	19.9300	19.9216	19.7398	19.0567	18.1833	17.5022	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9813	0.9658	0.9300	0.8501	0.7167	0.5355	0.3721	0.4245	0.6874	0.9010	0.9689	0.9847	(94)
Useful gains	508.9082	606.4625	702.7771	760.9910	707.4295	523.6762	347.0180	362.2309	514.8683	552.5823	500.4124	478.5977	(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													
	1456.8980	1423.8316	1305.4407	1102.6460	851.4188	560.3635	354.4140	373.9957	602.9354	910.5178	1199.2754	1446.8509	(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													
	705.3044	549.2720	448.3817	245.9916	107.1280	0.0000	0.0000	0.0000	0.0000	266.3041	503.1813	720.3803	(98)
Space heating												3545.9434	(98)
Space heating per m2											(98) / (4) =	42.3346	(99)

8c. Space cooling requirement

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	90.0000	(206)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	3939.9371	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	705.3044	549.2720	448.3817	245.9916	107.1280	0.0000	0.0000	0.0000	0.0000	266.3041	503.1813	720.3803	(98)
Space heating efficiency (main heating system 1)													
	90.0000	90.0000	90.0000	90.0000	90.0000	0.0000	0.0000	0.0000	0.0000	90.0000	90.0000	90.0000	(210)
Space heating fuel (main heating system)													
	783.6716	610.3022	498.2019	273.3240	119.0311	0.0000	0.0000	0.0000	0.0000	295.8934	559.0904	800.4226	(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													
	204.7804	180.5392	187.8394	166.6041	161.3021	142.0659	136.1099	151.7307	153.4064	174.6838	186.4715	199.9268	(64)
Efficiency of water heater												90.0000	(216)
(217)m	90.0000	90.0000	90.0000	90.0000	90.0000	90.0000	90.0000	90.0000	90.0000	90.0000	90.0000	90.0000	(217)
Fuel for water heating, kWh/month													
	227.5338	200.5991	208.7104	185.1156	179.2246	157.8510	151.2333	168.5897	170.4516	194.0931	207.1905	222.1409	(219)
Water heating fuel used												2272.7335	(219)

Annual totals kWh/year		
Space heating fuel - main system	3939.9371	(211)
Space heating fuel - secondary	0.0000	(215)
Electricity for pumps and fans:		
central heating pump	30.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	75.0000	(231)
Electricity for lighting (calculated in Appendix L)	363.1859	(232)
Total delivered energy for all uses	6650.8566	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3939.9371	0.2160	851.0264	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2272.7335	0.2160	490.9104	(264)
Space and water heating			1341.9369	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	363.1859	0.5190	188.4935	(268)
Total CO2, kg/year			1569.3553	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			18.7400	(273)

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

DER		18.7400	ZC1
Total Floor Area	TFA	83.7600	
Assumed number of occupants	N	2.5303	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.0681	ZC2
CO2 emissions from cooking, equation (L16)		2.1458	ZC3
Total CO2 emissions		36.9538	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		36.9538	ZC8

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	41.8800 (1b)	x	2.4400 (2b)	=	102.1872	(1b) - (3b)
First floor	41.8800 (1c)	x	2.8000 (2c)	=	117.2640	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	83.7600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	219.4512	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							3 * 10 =	30.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1367 (8)
Pressure test		Yes
Measured/design AP50		5.0000
Infiltration rate		0.3867 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3287 (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	0.4191	0.4109	0.4027	0.3616	0.3534	0.3123	0.3123	0.3040	0.3287	0.3534	0.3698	0.3862	(22b)
Effective ac	0.5878	0.5844	0.5811	0.5654	0.5624	0.5488	0.5488	0.5462	0.5540	0.5624	0.5684	0.5746	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Semi-glazed door			1.8900	1.2000	2.2680			(26a)
TER Opening Type (Uw = 1.40)			14.6000	1.3258	19.3561			(27)
Heat Loss Floor 1			41.8800	0.1300	5.4444			(28a)
External Wall 1	105.0600	16.4900	88.5700	0.1800	15.9426			(29a)
External Roof 1	41.8800		41.8800	0.1300	5.4444			(30)
Total net area of external elements Aum(A, m2)			188.8200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		48.4555			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.0362	(36)
Total fabric heat loss					(33) + (36) =		59.4917	(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	42.5692	42.3222	42.0802	40.9432	40.7305	39.7402	39.7402	39.5568	40.1216	40.7305	41.1608	41.6107	(38)
Heat transfer coeff	102.0608	101.8139	101.5718	100.4348	100.2221	99.2318	99.2318	99.0485	99.6133	100.2221	100.6525	101.1024	(39)
Average = Sum(39)m / 12 =												100.4338	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2185	1.2155	1.2127	1.1991	1.1965	1.1847	1.1847	1.1825	1.1893	1.1965	1.2017	1.2070	(40)
HLP (average)												1.1991	(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												2.5303	(42)
Average daily hot water use (litres/day)												94.2957	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	103.7252	99.9534	96.1816	92.4097	88.6379	84.8661	84.8661	88.6379	92.4097	96.1816	99.9534	103.7252	(44)
Energy conte	153.8215	134.5333	138.8263	121.0321	116.1332	100.2141	92.8631	106.5618	107.8345	125.6707	137.1794	148.9679	(45)
Energy content (annual)										Total = Sum(45)m =		1483.6379	(45)
Distribution loss (46)m = 0.15 x (45)m	23.0732	20.1800	20.8239	18.1548	17.4200	15.0321	13.9295	15.9843	16.1752	18.8506	20.5769	22.3452	(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													

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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	50.9589	46.0059	49.0131	45.5719	45.1689	41.8518	43.2468	45.1689	45.5719	49.0131	49.2921	50.9589	(61)
Total heat required for water heating calculated for each month													
	204.7804	180.5392	187.8394	166.6041	161.3021	142.0659	136.1099	151.7307	153.4064	174.6838	186.4715	199.9268	(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													
	204.7804	180.5392	187.8394	166.6041	161.3021	142.0659	136.1099	151.7307	153.4064	174.6838	186.4715	199.9268	(64)
								Total per year (kWh/year) = Sum(64)m =				2045.4602	(64)
Heat gains from water heating, kWh/month													
	63.8854	56.2338	58.4130	51.6362	49.9065	43.7841	41.6887	46.7240	47.2479	54.0388	57.9352	62.2716	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	126.5172	126.5172	126.5172	126.5172	126.5172	126.5172	126.5172	126.5172	126.5172	126.5172	126.5172	126.5172	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	20.7909	18.4663	15.0178	11.3694	8.4988	7.1750	7.7529	10.0775	13.5260	17.1743	20.0450	21.3687	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	227.1192	229.4759	223.5369	210.8934	194.9333	179.9330	169.9119	167.5552	173.4942	186.1377	202.0978	217.0981	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.6517	35.6517	35.6517	35.6517	35.6517	35.6517	35.6517	35.6517	35.6517	35.6517	35.6517	35.6517	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	(71)
Water heating gains (Table 5)													
	85.8674	83.6813	78.5121	71.7169	67.0787	60.8113	56.0332	62.8011	65.6221	72.6328	80.4655	83.6983	(72)
Total internal gains													
	397.7327	395.5786	381.0220	357.9349	334.4659	311.8745	297.6532	304.3889	316.5975	339.8999	366.5634	386.1203	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9700	19.6403	0.6300	0.7000	0.7700	29.8315	(76)
South	0.7300	46.7521	0.6300	0.7000	0.7700	10.4303	(78)
West	8.9000	19.6403	0.6300	0.7000	0.7700	53.4206	(80)

Solar gains	93.6824	179.9410	289.9650	415.7547	505.0107	515.3970	491.2961	424.7186	334.6645	211.6705	116.1691	77.4753	(83)
Total gains	491.4151	575.5197	670.9870	773.6896	839.4766	827.2716	788.9492	729.1075	651.2619	551.5704	482.7325	463.5955	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	56.9921	57.1304	57.2665	57.9148	58.0378	58.6169	58.6169	58.7255	58.3925	58.0378	57.7896	57.5325	
alpha	4.7995	4.8087	4.8178	4.8610	4.8692	4.9078	4.9078	4.9150	4.8928	4.8692	4.8526	4.8355	
util living area													
	0.9982	0.9958	0.9875	0.9564	0.8699	0.7060	0.5394	0.6001	0.8519	0.9782	0.9962	0.9986	(86)
MIT	19.6557	19.8187	20.1019	20.4718	20.7757	20.9432	20.9877	20.9799	20.8524	20.4410	19.9801	19.6289	(87)
Th 2	19.9052	19.9076	19.9099	19.9207	19.9228	19.9322	19.9322	19.9340	19.9286	19.9228	19.9187	19.9144	(88)
util rest of house													
	0.9975	0.9943	0.9830	0.9398	0.8219	0.6119	0.4157	0.4732	0.7794	0.9670	0.9947	0.9982	(89)
MIT 2	18.1170	18.3565	18.7692	19.3027	19.7043	19.8949	19.9278	19.9258	19.8095	19.2698	18.6007	18.0842	(90)
Living area fraction										fLA = Living area / (4) =		0.2059	(91)
MIT	18.4339	18.6577	19.0437	19.5434	19.9249	20.1108	20.1461	20.1429	20.0243	19.5110	18.8848	18.4023	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4339	18.6577	19.0437	19.5434	19.9249	20.1108	20.1461	20.1429	20.0243	19.5110	18.8848	18.4023	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9962	0.9918	0.9779	0.9325	0.8220	0.6289	0.4413	0.4993	0.7870	0.9611	0.9924	0.9971	(94)
Useful gains	489.5666	570.7860	656.1696	721.4357	690.0270	520.2320	348.1483	364.0468	512.5123	530.1169	479.0650	462.2673	(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													
	1442.5181	1400.7211	1274.0843	1068.9728	824.3196	546.8428	351.8868	370.7289	590.1385	893.0835	1186.1712	1435.8879	(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													
	708.9959	557.7164	459.7285	250.2267	99.9137	0.0000	0.0000	0.0000	0.0000	270.0472	509.1165	724.3737	(98)
Space heating												3580.1186	(98)
Space heating per m2											(98) / (4) =	42.7426	(99)

8c. Space cooling requirement

Not applicable

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												93.4000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												3833.1034	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	708.9959	557.7164	459.7285	250.2267	99.9137	0.0000	0.0000	0.0000	0.0000	270.0472	509.1165	724.3737	(98)
Space heating efficiency (main heating system 1)													
	93.4000	93.4000	93.4000	93.4000	93.4000	0.0000	0.0000	0.0000	0.0000	93.4000	93.4000	93.4000	(210)
Space heating fuel (main heating system)													
	759.0963	597.1267	492.2147	267.9087	106.9740	0.0000	0.0000	0.0000	0.0000	289.1297	545.0926	775.5607	(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													
	204.7804	180.5392	187.8394	166.6041	161.3021	142.0659	136.1099	151.7307	153.4064	174.6838	186.4715	199.9268	(64)
Efficiency of water heater												80.3000	(216)
(217)m	87.9217	87.7024	87.2179	86.0729	83.8848	80.3000	80.3000	80.3000	80.3000	86.1441	87.4513	88.0057	(217)
Fuel for water heating, kWh/month													
	232.9122	205.8544	215.3679	193.5616	192.2901	176.9189	169.5018	188.9548	191.0416	202.7808	213.2289	227.1748	(219)
Water heating fuel used												2409.5879	(219)
Annual totals kWh/year													
Space heating fuel - main system												3833.1034	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												367.1739	(232)
Total delivered energy for all uses												6684.8652	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3833.1034	0.2160	827.9503	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2409.5879	0.2160	520.4710	(264)
Space and water heating			1348.4213	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	367.1739	0.5190	190.5633	(268)
Total CO2, kg/m2/year			1577.9096	(272)
Emissions per m2 for space and water heating			16.0986	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.2751	(272b)
Emissions per m2 for pumps and fans			0.4647	(272c)
Target Carbon Dioxide Emission Rate (TER) = (16.0986 * 1.00) + 2.2751 + 0.4647, rounded to 2 d.p.			18.8400	(273)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	41.8800 (1b)	x	2.4400 (2b)	=	102.1872 (1b) - (3b)	
First floor	41.8800 (1c)	x	2.8000 (2c)	=	117.2640 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	83.7600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	219.4512	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							3 * 10 =	30.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1367	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3867	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3287	(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	0.4191	0.4109	0.4027	0.3616	0.3534	0.3123	0.3123	0.3040	0.3287	0.3534	0.3698	0.3862	(22b)
Effective ac	0.5878	0.5844	0.5811	0.5654	0.5624	0.5488	0.5488	0.5462	0.5540	0.5624	0.5684	0.5746	(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	
Opening Type 1			1.8900	1.3000	2.4570			(26a)
Opening Type 2 (Uw = 1.30)			14.6000	1.2357	18.0418			(27)
Heat Loss Floor 1			41.8800	0.1100	4.6068	75.0000	3141.0000	(28a)
External Wall 1	105.0600	16.4900	88.5700	0.2500	22.1425	60.0000	5314.2000	(29a)
External Roof 1	41.8800		41.8800	0.1100	4.6068	9.0000	376.9200	(30)
Total net area of external elements Aum(A, m2)			188.8200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		51.8549			(33)
Party Wall 1			45.3300	0.0000	0.0000	70.0000	3173.1000	(32)
Internal Wall 1			106.8700			9.0000	961.8300	(32c)
Internal Floor 1			41.8800			18.0000	753.8400	(32d)
Internal Ceiling 1			41.8800			9.0000	376.9200	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		14097.8100	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							168.3120	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.9544	(36)
Total fabric heat loss					(33) + (36) =		65.8094	(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	42.5692	42.3222	42.0802	40.9432	40.7305	39.7402	39.7402	39.5568	40.1216	40.7305	41.1608	41.6107	(38)
Heat transfer coeff	108.3785	108.1316	107.8895	106.7525	106.5398	105.5495	105.5495	105.3662	105.9310	106.5398	106.9702	107.4201	(39)
Average = Sum(39)m / 12 =												106.7515	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2939	1.2910	1.2881	1.2745	1.2720	1.2601	1.2601	1.2580	1.2647	1.2720	1.2771	1.2825	(40)
HLP (average)												1.2745	(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		2.5303 (42)
Average daily hot water use (litres/day)		94.2957 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	103.7252	99.9534	96.1816	92.4097	88.6379	84.8661	84.8661	88.6379	92.4097	96.1816	99.9534	103.7252	(44)
Energy conte	153.8215	134.5333	138.8263	121.0321	116.1332	100.2141	92.8631	106.5618	107.8345	125.6707	137.1794	148.9679	(45)
Energy content (annual)										Total = Sum(45)m =		1483.6379	(45)

Distribution loss (46)m = 0.15 x (45)m

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

	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)
Heat gains from water heating, kWh/month													
	32.6871	28.5883	29.5006	25.7193	24.6783	21.2955	19.7334	22.6444	22.9148	26.7050	29.1506	31.6557	(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	126.5172	126.5172	126.5172	126.5172	126.5172	126.5172	126.5172	126.5172	126.5172	126.5172	126.5172	126.5172	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	20.5651	18.2657	14.8547	11.2460	8.4065	7.0971	7.6687	9.9680	13.3791	16.9878	19.8273	21.1367	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	227.1192	229.4759	223.5369	210.8934	194.9333	179.9330	169.9119	167.5552	173.4942	186.1377	202.0978	217.0981	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.6517	35.6517	35.6517	35.6517	35.6517	35.6517	35.6517	35.6517	35.6517	35.6517	35.6517	35.6517	(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)													
	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	(71)
Water heating gains (Table 5)													
	43.9342	42.5421	39.6513	35.7213	33.1698	29.5771	26.5234	30.4360	31.8261	35.8938	40.4870	42.5480	(72)
Total internal gains													
	352.5736	351.2390	338.9981	318.8158	297.4647	277.5624	265.0592	268.9143	279.6546	299.9745	323.3672	341.7378	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9700	19.6403	0.7600	0.7500	0.7700	38.5578	(76)
South	0.7300	46.7521	0.7600	0.7500	0.7700	13.4813	(78)
West	8.9000	19.6403	0.7600	0.7500	0.7700	69.0471	(80)

Solar gains	121.0862	232.5768	374.7847	537.3700	652.7350	666.1594	635.0085	548.9560	432.5595	273.5877	150.1505	100.1381	(83)
Total gains	473.6598	583.8158	713.7828	856.1858	950.1997	943.7218	900.0677	817.8704	712.2141	573.5622	473.5177	441.8759	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	36.1332	36.2157	36.2969	36.6835	36.7568	37.1016	37.1016	37.1662	36.9680	36.7568	36.6089	36.4556	
alpha	3.4089	3.4144	3.4198	3.4456	3.4505	3.4734	3.4734	3.4777	3.4645	3.4505	3.4406	3.4304	
util living area													
	0.9923	0.9839	0.9617	0.9026	0.7912	0.6337	0.4895	0.5493	0.7860	0.9475	0.9866	0.9939	(86)
MIT	19.0436	19.2956	19.7162	20.2388	20.6492	20.8860	20.9650	20.9479	20.7484	20.1713	19.5051	19.0008	(87)
Th 2	19.8456	19.8479	19.8502	19.8609	19.8629	19.8722	19.8722	19.8739	19.8686	19.8629	19.8588	19.8546	(88)
util rest of house													
	0.9905	0.9800	0.9521	0.8782	0.7398	0.5470	0.3751	0.4320	0.7133	0.9293	0.9827	0.9925	(89)
MIT 2	18.0705	18.3222	18.7379	19.2474	19.6182	19.8129	19.8608	19.8552	19.7171	19.1967	18.5402	18.0346	(90)
Living area fraction										fLA = Living area / (4) =		0.2059	(91)
MIT	18.2709	18.5227	18.9394	19.4515	19.8305	20.0339	20.0882	20.0802	19.9295	19.3974	18.7389	18.2336	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.2709	18.5227	18.9394	19.4515	19.8305	20.0339	20.0882	20.0802	19.9295	19.3974	18.7389	18.2336	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9868	0.9740	0.9424	0.8677	0.7382	0.5604	0.3980	0.4548	0.7178	0.9197	0.9774	0.9895	(94)
Useful gains	467.4273	568.6080	672.6946	742.8959	701.4119	528.8352	358.2407	371.9995	511.2043	527.5023	462.8277	437.2167	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1514.1491	1473.0391	1342.0759	1126.4037	866.2242	573.5492	368.1760	387.7735	617.5194	937.2744	1245.0169	1507.4863	(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													
	778.7610	607.7777	498.0197	276.1256	122.6203	0.0000	0.0000	0.0000	0.0000	304.8704	563.1762	796.2806	(98)
Space heating												3947.6316	(98)
Space heating per m2											(98) / (4) =	47.1303	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	992.1657	781.0666	800.7828	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8433	0.8972	0.8685	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	836.6654	700.7892	695.4674	0.0000	0.0000	0.0000	0.0000	(102)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1197.8238	1144.8320	1050.3946	0.0000	0.0000	0.0000	0.0000 (103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	260.0340	330.3679	264.0658	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												854.4677 (104)
Cooled fraction										fC = cooled area / (4) =		1.0000 (105)
Intermittency factor (Table 10b)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	65.0085	82.5920	66.0165	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												213.6169 (107)
Space cooling per m2												2.5503 (108)
Energy for space heating												47.1303 (99)
Energy for space cooling												2.5503 (108)
Total												49.6806 (109)
Dwelling Fabric Energy Efficiency (DFEE)												49.7 (109)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	41.8800 (1b)	x	2.4400 (2b)	=	102.1872	(1b) - (3b)
First floor	41.8800 (1c)	x	2.8000 (2c)	=	117.2640	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	83.7600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	219.4512	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							3 * 10 =	30.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1367 (8)
Pressure test		Yes
Measured/design AP50		5.0000
Infiltration rate		0.3867 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3287 (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	0.4191	0.4109	0.4027	0.3616	0.3534	0.3123	0.3123	0.3040	0.3287	0.3534	0.3698	0.3862	(22b)
Effective ac	0.5878	0.5844	0.5811	0.5654	0.5624	0.5488	0.5488	0.5462	0.5540	0.5624	0.5684	0.5746	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Semi-glazed door			1.8900	1.2000	2.2680			(26a)
TER Opening Type (Uw = 1.40)			14.6000	1.3258	19.3561			(27)
Heat Loss Floor 1			41.8800	0.1300	5.4444			(28a)
External Wall 1	105.0600	16.4900	88.5700	0.1800	15.9426			(29a)
External Roof 1	41.8800		41.8800	0.1300	5.4444			(30)
Total net area of external elements Aum(A, m2)			188.8200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		48.4555			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.0362	(36)
Total fabric heat loss					(33) + (36) =		59.4917	(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	42.5692	42.3222	42.0802	40.9432	40.7305	39.7402	39.7402	39.5568	40.1216	40.7305	41.1608	41.6107	(38)
Heat transfer coeff	102.0608	101.8139	101.5718	100.4348	100.2221	99.2318	99.2318	99.0485	99.6133	100.2221	100.6525	101.1024	(39)
Average = Sum(39)m / 12 =												100.4338	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2185	1.2155	1.2127	1.1991	1.1965	1.1847	1.1847	1.1825	1.1893	1.1965	1.2017	1.2070	(40)
HLP (average)												1.1991	(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		2.5303 (42)
Average daily hot water use (litres/day)		94.2957 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	103.7252	99.9534	96.1816	92.4097	88.6379	84.8661	84.8661	88.6379	92.4097	96.1816	99.9534	103.7252	(44)
Energy conte	153.8215	134.5333	138.8263	121.0321	116.1332	100.2141	92.8631	106.5618	107.8345	125.6707	137.1794	148.9679	(45)
Energy content (annual)										Total = Sum(45)m =		1483.6379	(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													

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

	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)
Heat gains from water heating, kWh/month													
	32.6871	28.5883	29.5006	25.7193	24.6783	21.2955	19.7334	22.6444	22.9148	26.7050	29.1506	31.6557	(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	126.5172	126.5172	126.5172	126.5172	126.5172	126.5172	126.5172	126.5172	126.5172	126.5172	126.5172	126.5172	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	20.7909	18.4663	15.0178	11.3694	8.4988	7.1750	7.7529	10.0775	13.5260	17.1743	20.0450	21.3687	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	227.1192	229.4759	223.5369	210.8934	194.9333	179.9330	169.9119	167.5552	173.4942	186.1377	202.0978	217.0981	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.6517	35.6517	35.6517	35.6517	35.6517	35.6517	35.6517	35.6517	35.6517	35.6517	35.6517	35.6517	(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)													
	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	(71)
Water heating gains (Table 5)													
	43.9342	42.5421	39.6513	35.7213	33.1698	29.5771	26.5234	30.4360	31.8261	35.8938	40.4870	42.5480	(72)
Total internal gains													
	352.7995	351.4395	339.1612	318.9393	297.5570	277.6403	265.1434	269.0238	279.8015	300.1610	323.5849	341.9699	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9700	19.6403	0.6300	0.7000	0.7700	29.8315	(76)
South	0.7300	46.7521	0.6300	0.7000	0.7700	10.4303	(78)
West	8.9000	19.6403	0.6300	0.7000	0.7700	53.4206	(80)

Solar gains	93.6824	179.9410	289.9650	415.7547	505.0107	515.3970	491.2961	424.7186	334.6645	211.6705	116.1691	77.4753	(83)
Total gains	446.4819	531.3805	629.1262	734.6940	802.5678	793.0374	756.4394	693.7424	614.4659	511.8315	439.7540	419.4452	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	56.9921	57.1304	57.2665	57.9148	58.0378	58.6169	58.6169	58.7255	58.3925	58.0378	57.7896	57.5325	
alpha	4.7995	4.8087	4.8178	4.8610	4.8692	4.9078	4.9078	4.9150	4.8928	4.8692	4.8526	4.8355	
util living area													
	0.9988	0.9970	0.9904	0.9639	0.8852	0.7274	0.5601	0.6256	0.8732	0.9838	0.9975	0.9991	(86)
MIT	19.6063	19.7707	20.0580	20.4364	20.7536	20.9352	20.9856	20.9759	20.8322	20.4010	19.9332	19.5802	(87)
Th 2	19.9052	19.9076	19.9099	19.9207	19.9228	19.9322	19.9322	19.9340	19.9286	19.9228	19.9187	19.9144	(88)
util rest of house													
	0.9984	0.9959	0.9868	0.9496	0.8404	0.6337	0.4329	0.4957	0.8059	0.9751	0.9964	0.9988	(89)
MIT 2	18.6351	18.8009	19.0882	19.4660	19.7564	19.9026	19.9286	19.9272	19.8335	19.4389	18.9722	18.6162	(90)
Living area fraction										fLA = Living area / (4) =		0.2059	(91)
MIT	18.8351	19.0007	19.2879	19.6658	19.9618	20.1153	20.1463	20.1432	20.0392	19.6370	19.1701	18.8147	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8351	19.0007	19.2879	19.6658	19.9618	20.1153	20.1463	20.1432	20.0392	19.6370	19.1701	18.8147	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9978	0.9947	0.9841	0.9453	0.8423	0.6511	0.4593	0.5227	0.8142	0.9720	0.9954	0.9984	(94)
Useful gains	445.5004	528.5597	619.1093	694.5348	676.0035	516.3600	347.4584	362.6184	500.2969	497.5052	437.7236	418.7636	(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													
	1483.4662	1435.6430	1298.8909	1081.2641	828.0141	547.2888	351.9076	370.7550	591.6232	905.7076	1214.8873	1477.5839	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	772.2466	609.5599	505.7575	278.4451	113.0959	0.0000	0.0000	0.0000	0.0000	303.7026	559.5579	787.7623	(98)
Space heating												3930.1278	(98)
Space heating per m2											(98) / (4) =	46.9213	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	932.7794	734.3157	752.7683	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8662	0.9250	0.8976	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	808.0056	679.2101	675.7080	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1021.8029	977.0669	905.4557	0.0000	0.0000	0.0000	0.0000	(103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	153.9340	221.6055	170.9323	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												546.4718	(104)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Cooled fraction											fC = cooled area / (4) =	1.0000 (105)
Intermittency factor (Table 10b)												
0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	(106)
Space cooling kWh												
0.0000	0.0000	0.0000	0.0000	0.0000	38.4835	55.4014	42.7331	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling												136.6180 (107)
Space cooling per m2												1.6311 (108)
Energy for space heating												46.9213 (99)
Energy for space cooling												1.6311 (108)
Total												48.5524 (109)
Target Fabric Energy Efficiency (TFEE)												55.8 (109)

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	41.8800 (1b)	x	2.4400 (2b)	=	102.1872	(1b) - (3b)
First floor	41.8800 (1c)	x	2.8000 (2c)	=	117.2640	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	83.7600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	219.4512	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							4 * 10 =	40.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1823 (8)
Pressure test		Yes
Measured/design AP50		5.0000
Infiltration rate		0.4323 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3674 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.9000	5.8000	5.5000	4.8000	4.5000	4.2000	4.1000	4.0000	4.5000	4.9000	5.2000	5.4000	(22)
Wind factor	1.4750	1.4500	1.3750	1.2000	1.1250	1.0500	1.0250	1.0000	1.1250	1.2250	1.3000	1.3500	(22a)
Adj infilt rate	0.5420	0.5328	0.5052	0.4409	0.4134	0.3858	0.3766	0.3674	0.4134	0.4501	0.4777	0.4960	(22b)
Effective ac	0.6469	0.6419	0.6276	0.5972	0.5854	0.5744	0.5709	0.5675	0.5854	0.6013	0.6141	0.6230	(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	
Opening Type 1			1.8900	1.3000	2.4570			(26a)
Opening Type 2 (Uw = 1.30)			14.6000	1.2357	18.0418			(27)
Heat Loss Floor 1			41.8800	0.1100	4.6068	75.0000	3141.0000	(28a)
External Wall 1	105.0600	16.4900	88.5700	0.2500	22.1425	60.0000	5314.2000	(29a)
External Roof 1	41.8800		41.8800	0.1100	4.6068	9.0000	376.9200	(30)
Total net area of external elements Aum(A, m2)			188.8200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		51.8549			(33)
Party Wall 1			45.3300	0.0000	0.0000	70.0000	3173.1000	(32)
Internal Wall 1			106.8700			9.0000	961.8300	(32c)
Internal Floor 1			41.8800			18.0000	753.8400	(32d)
Internal Ceiling 1			41.8800			18.0000	753.8400	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		14474.7300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							172.8120	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.9544	(36)
Total fabric heat loss					(33) + (36) =		65.8094	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	46.8450	46.4875	45.4518	43.2489	42.3965	41.5990	41.3454	41.0979	42.3965	43.5453	44.4710	45.1187	(38)
Heat transfer coeff	112.6543	112.2969	111.2611	109.0582	108.2058	107.4084	107.1548	106.9073	108.2058	109.3546	110.2804	110.9281	(39)
Average = Sum(39)m / 12 =												109.4763	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3450	1.3407	1.3283	1.3020	1.2919	1.2823	1.2793	1.2764	1.2919	1.3056	1.3166	1.3244	(40)
HLP (average)												1.3070	(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	2.5303 (42)
Average daily hot water use (litres/day)	94.2957 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	103.7252	99.9534	96.1816	92.4097	88.6379	84.8661	84.8661	88.6379	92.4097	96.1816	99.9534	103.7252	(44)
Energy conte	153.8215	134.5333	138.8263	121.0321	116.1332	100.2141	92.8631	106.5618	107.8345	125.6707	137.1794	148.9679	(45)
Energy content (annual)										Total = Sum(45)m =		1483.6379	(45)

Distribution loss (46)m = 0.15 x (45)m

CALCULATION OF HEAT DEMAND 09 Jan 2014

	23.0732	20.1800	20.8239	18.1548	17.4200	15.0321	13.9295	15.9843	16.1752	18.8506	20.5769	22.3452	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	50.9589	46.0059	49.0131	45.5719	45.1689	41.8518	43.2468	45.1689	45.5719	49.0131	49.2921	50.9589	(61)
Total heat required for water heating calculated for each month													
	204.7804	180.5392	187.8394	166.6041	161.3021	142.0659	136.1099	151.7307	153.4064	174.6838	186.4715	199.9268	(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													
	204.7804	180.5392	187.8394	166.6041	161.3021	142.0659	136.1099	151.7307	153.4064	174.6838	186.4715	199.9268	(64)
								Total per year (kWh/year) = Sum(64)m =				2045.4602	(64)
RHI water heating demand												2045	(64)
Heat gains from water heating, kWh/month													
	63.8854	56.2338	58.4130	51.6362	49.9065	43.7841	41.6887	46.7240	47.2479	54.0388	57.9352	62.2716	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	151.8206	151.8206	151.8206	151.8206	151.8206	151.8206	151.8206	151.8206	151.8206	151.8206	151.8206	151.8206	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	51.4127	45.6643	37.1367	28.1149	21.0162	17.7428	19.1717	24.9201	33.4477	42.4695	49.5682	52.8416	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	338.9838	342.5014	333.6372	314.7663	290.9452	268.5568	253.5999	250.0823	258.9465	277.8174	301.6385	324.0270	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	52.7124	52.7124	52.7124	52.7124	52.7124	52.7124	52.7124	52.7124	52.7124	52.7124	52.7124	52.7124	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	(71)
Water heating gains (Table 5)													
	85.8674	83.6813	78.5121	71.7169	67.0787	60.8113	56.0332	62.8011	65.6221	72.6328	80.4655	83.6983	(72)
Total internal gains													
	582.5833	578.1663	555.6053	520.9174	485.3594	453.4301	435.1241	444.1228	464.3357	499.2390	537.9915	566.8862	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9700	18.1436	0.7600	0.7500	0.7700	35.6195	(76)
South	0.7300	43.2834	0.7600	0.7500	0.7700	12.4811	(78)
West	8.9000	18.1436	0.7600	0.7500	0.7700	63.7854	(80)

Solar gains	111.8859	224.1769	367.2797	519.7975	629.2588	639.7961	608.4174	524.7911	417.8309	265.5391	136.6376	95.4683	(83)
Total gains	694.4692	802.3432	922.8850	1040.7149	1114.6182	1093.2263	1043.5414	968.9139	882.1666	764.7781	674.6291	662.3545	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	35.6911	35.8047	36.1380	36.8680	37.1584	37.4343	37.5229	37.6098	37.1584	36.7681	36.4594	36.2465	
alpha	3.3794	3.3870	3.4092	3.4579	3.4772	3.4956	3.5015	3.5073	3.4772	3.4512	3.4306	3.4164	
util living area													
	0.9798	0.9680	0.9391	0.8779	0.7728	0.6292	0.5127	0.5606	0.7592	0.9157	0.9694	0.9828	(86)
MIT	19.2188	19.4101	19.8116	20.2787	20.6525	20.8771	20.9527	20.9355	20.7500	20.2502	19.6523	19.1791	(87)
Th 2	19.8058	19.8091	19.8187	19.8392	19.8472	19.8547	19.8571	19.8594	19.8472	19.8365	19.8278	19.8218	(88)
util rest of house													
	0.9752	0.9610	0.9256	0.8510	0.7238	0.5514	0.4142	0.4611	0.6918	0.8910	0.9614	0.9790	(89)
MIT 2	17.4695	17.7464	18.3259	18.9894	19.4855	19.7548	19.8292	19.8188	19.6182	18.9652	18.1126	17.4220	(90)
Living area fraction									fLA = Living area / (4) =			0.2059	(91)
MIT	17.8298	18.0890	18.6319	19.2549	19.7258	19.9859	20.0606	20.0487	19.8513	19.2298	18.4297	17.7839	(92)
Temperature adjustment												-0.1500	
adjusted MIT	17.6798	17.9390	18.4819	19.1049	19.5758	19.8359	19.9106	19.8987	19.7013	19.0798	18.2797	17.6339	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9632	0.9455	0.9056	0.8305	0.7108	0.5501	0.4190	0.4648	0.6820	0.8704	0.9463	0.9683	(94)
Useful gains	668.8802	758.5832	835.7555	864.2937	792.2944	601.3531	437.2695	450.3157	601.6582	665.6453	638.3896	641.3384	(95)
Ext temp.	3.8000	4.1000	5.7000	8.0000	10.8000	13.8000	15.7000	15.5000	13.2000	9.8000	6.5000	3.6000	(96)
Heat loss rate W													
	1563.6163	1554.0819	1422.1271	1211.0816	949.5977	648.3059	451.1818	470.2574	703.4792	1014.7884	1299.0654	1556.7505	(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													
	665.6837	534.5751	436.2605	249.6873	117.0337	0.0000	0.0000	0.0000	0.0000	259.7625	475.6866	681.0666	(98)
Space heating												3419.7559	(98)
RHI space heating demand												3420	(98)


Aeratech Ltd
Air leakage testing and energy services

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	41.8800	(1b)	x 2.4400	(2b)	= 102.1872	(1b) - (3b)
First floor	41.8800	(1c)	x 2.8000	(2c)	= 117.2640	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	83.7600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	219.4512	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							4 * 10 =	40.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1823 (8)
Pressure test		Yes
Measured/design AP50		5.0000
Infiltration rate		0.4323 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3674 (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	0.4685	0.4593	0.4501	0.4042	0.3950	0.3491	0.3491	0.3399	0.3674	0.3950	0.4134	0.4317	(22b)
Effective ac	0.6097	0.6055	0.6013	0.5817	0.5780	0.5609	0.5609	0.5578	0.5675	0.5780	0.5854	0.5932	(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	
Opening Type 1			1.8900	1.3000	2.4570			(26a)
Opening Type 2 (Uw = 1.30)			14.6000	1.2357	18.0418			(27)
Heat Loss Floor 1			41.8800	0.1100	4.6068	75.0000	3141.0000	(28a)
External Wall 1	105.0600	16.4900	88.5700	0.2500	22.1425	60.0000	5314.2000	(29a)
External Roof 1	41.8800		41.8800	0.1100	4.6068	9.0000	376.9200	(30)
Total net area of external elements Aum(A, m2)			188.8200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		51.8549			(33)
Party Wall 1			45.3300	0.0000	0.0000	70.0000	3173.1000	(32)
Internal Wall 1			106.8700			9.0000	961.8300	(32c)
Internal Floor 1			41.8800			18.0000	753.8400	(32d)
Internal Ceiling 1			41.8800			18.0000	753.8400	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		14474.7300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							172.8120	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.9544	(36)
Total fabric heat loss					(33) + (36) =		65.8094	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	44.1563	43.8477	43.5453	42.1245	41.8587	40.6213	40.6213	40.3922	41.0979	41.8587	42.3965	42.9586	(38)
Heat transfer coeff	109.9657	109.6571	109.3546	107.9339	107.6681	106.4307	106.4307	106.2015	106.9073	107.6681	108.2058	108.7680	(39)
Average = Sum(39)m / 12 =												107.9326	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3129	1.3092	1.3056	1.2886	1.2854	1.2707	1.2707	1.2679	1.2764	1.2854	1.2919	1.2986	(40)
HLP (average)												1.2886	(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	2.5303	(42)
Average daily hot water use (litres/day)	94.2957	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	103.7252	99.9534	96.1816	92.4097	88.6379	84.8661	84.8661	88.6379	92.4097	96.1816	99.9534	103.7252	(44)
Energy conte	153.8215	134.5333	138.8263	121.0321	116.1332	100.2141	92.8631	106.5618	107.8345	125.6707	137.1794	148.9679	(45)
Energy content (annual)										Total = Sum(45)m =		1483.6379	(45)
Distribution loss (46)m = 0.15 x (45)m													

CALCULATION OF ENERGY RATINGS 09 Jan 2014

	23.0732	20.1800	20.8239	18.1548	17.4200	15.0321	13.9295	15.9843	16.1752	18.8506	20.5769	22.3452	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	50.9589	46.0059	49.0131	45.5719	45.1689	41.8518	43.2468	45.1689	45.5719	49.0131	49.2921	50.9589	(61)
Total heat required for water heating calculated for each month													
	204.7804	180.5392	187.8394	166.6041	161.3021	142.0659	136.1099	151.7307	153.4064	174.6838	186.4715	199.9268	(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													
	204.7804	180.5392	187.8394	166.6041	161.3021	142.0659	136.1099	151.7307	153.4064	174.6838	186.4715	199.9268	(64)
								Total per year (kWh/year) = Sum(64)m =				2045.4602	(64)
Heat gains from water heating, kWh/month													
	63.8854	56.2338	58.4130	51.6362	49.9065	43.7841	41.6887	46.7240	47.2479	54.0388	57.9352	62.2716	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	151.8206	151.8206	151.8206	151.8206	151.8206	151.8206	151.8206	151.8206	151.8206	151.8206	151.8206	151.8206	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	51.4127	45.6643	37.1367	28.1149	21.0162	17.7428	19.1717	24.9201	33.4477	42.4695	49.5682	52.8416	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	338.9838	342.5014	333.6372	314.7663	290.9452	268.5568	253.5999	250.0823	258.9465	277.8174	301.6385	324.0270	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	52.7124	52.7124	52.7124	52.7124	52.7124	52.7124	52.7124	52.7124	52.7124	52.7124	52.7124	52.7124	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	(71)
Water heating gains (Table 5)													
	85.8674	83.6813	78.5121	71.7169	67.0787	60.8113	56.0332	62.8011	65.6221	72.6328	80.4655	83.6983	(72)
Total internal gains													
	582.5833	578.1663	555.6053	520.9174	485.3594	453.4301	435.1241	444.1228	464.3357	499.2390	537.9915	566.8862	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9700	19.6403	0.7600	0.7500	0.7700	38.5578	(76)
South	0.7300	46.7521	0.7600	0.7500	0.7700	13.4813	(78)
West	8.9000	19.6403	0.7600	0.7500	0.7700	69.0471	(80)

Solar gains	121.0862	232.5768	374.7847	537.3700	652.7350	666.1594	635.0085	548.9560	432.5595	273.5877	150.1505	100.1381	(83)
Total gains	703.6694	810.7431	930.3900	1058.2874	1138.0943	1119.5896	1070.1326	993.0788	896.8951	772.8266	688.1420	667.0243	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	36.5638	36.6667	36.7681	37.2520	37.3440	37.7782	37.7782	37.8597	37.6098	37.3440	37.1584	36.9664	
alpha	3.4376	3.4444	3.4512	3.4835	3.4896	3.5185	3.5185	3.5240	3.5073	3.4896	3.4772	3.4644	
util living area													
	0.9769	0.9617	0.9276	0.8507	0.7251	0.5620	0.4238	0.4706	0.6968	0.8952	0.9631	0.9804	(86)
MIT	19.3600	19.5918	19.9669	20.4176	20.7471	20.9252	20.9788	20.9694	20.8378	20.3854	19.7933	19.3198	(87)
Th 2	19.8308	19.8336	19.8365	19.8498	19.8523	19.8639	19.8639	19.8660	19.8594	19.8523	19.8472	19.8420	(88)
util rest of house													
	0.9715	0.9531	0.9113	0.8178	0.6677	0.4775	0.3204	0.3635	0.6160	0.8641	0.9533	0.9759	(89)
MIT 2	17.6897	18.0242	18.5579	19.1845	19.6044	19.8098	19.8544	19.8511	19.7262	19.1614	18.3277	17.6389	(90)
Living area fraction										fLA = Living area / (4) =		0.2059	(91)
MIT	18.0337	18.3470	18.8481	19.4385	19.8397	20.0395	20.0859	20.0814	19.9551	19.4134	18.6295	17.9850	(92)
Temperature adjustment												-0.1500	
adjusted MIT	17.8837	18.1970	18.6981	19.2885	19.6897	19.8895	19.9359	19.9314	19.8051	19.2634	18.4795	17.8350	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9588	0.9365	0.8908	0.7989	0.6587	0.4795	0.3272	0.3700	0.6118	0.8440	0.9370	0.9645	(94)
Useful gains	674.6522	759.2858	828.7740	845.4217	749.6980	536.8860	350.1228	367.3966	548.6814	652.2836	644.8001	643.3149	(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													
	1493.7397	1458.1118	1333.9169	1121.2702	860.2388	562.9665	355.0462	375.0370	609.9163	932.7754	1231.3330	1483.0551	(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													
	609.4011	469.6110	375.8263	198.6110	82.2424	0.0000	0.0000	0.0000	0.0000	208.6859	422.3037	624.7667	(98)
Space heating												2991.4480	(98)
Space heating per m2											(98) / (4) =	35.7145	(99)

8c. Space cooling requirement

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 %)	90.0000	(206)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	3323.8311	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	609.4011	469.6110	375.8263	198.6110	82.2424	0.0000	0.0000	0.0000	0.0000	208.6859	422.3037	624.7667	(98)
Space heating efficiency (main heating system 1)	90.0000	90.0000	90.0000	90.0000	90.0000	0.0000	0.0000	0.0000	0.0000	90.0000	90.0000	90.0000	(210)
Space heating fuel (main heating system)	677.1124	521.7901	417.5848	220.6789	91.3804	0.0000	0.0000	0.0000	0.0000	231.8732	469.2263	694.1852	(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

	204.7804	180.5392	187.8394	166.6041	161.3021	142.0659	136.1099	151.7307	153.4064	174.6838	186.4715	199.9268	(64)
Efficiency of water heater												90.0000	(216)
(217)m	90.0000	90.0000	90.0000	90.0000	90.0000	90.0000	90.0000	90.0000	90.0000	90.0000	90.0000	90.0000	(217)
Fuel for water heating, kWh/month	227.5338	200.5991	208.7104	185.1156	179.2246	157.8510	151.2333	168.5897	170.4516	194.0931	207.1905	222.1409	(219)
Water heating fuel used												2272.7335	(219)

Annual totals kWh/year

Space heating fuel - main system	3323.8311	(211)
Space heating fuel - secondary	0.0000	(215)
Electricity for pumps and fans:		
central heating pump	30.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	75.0000	(231)
Electricity for lighting (calculated in Appendix L)	363.1859	(232)
Total delivered energy for all uses	6034.7505	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3323.8311	3.4800	115.6693	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	2272.7335	3.4800	79.0911	(247)
Pumps and fans for heating	75.0000	13.1900	9.8925	(249)
Energy for lighting	363.1859	13.1900	47.9042	(250)
Additional standing charges			120.0000	(251)
Total energy cost			372.5572	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.4200	(256)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	1.2152	(257)
SAP value	83.0474	
SAP rating (Section 12)	83	(258)
SAP band	B	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3323.8311	0.2160	717.9475	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2272.7335	0.2160	490.9104	(264)
Space and water heating			1208.8580	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	363.1859	0.5190	188.4935	(268)
Total kg/year			1436.2764	(272)
CO2 emissions per m2			17.1500	(273)
EI value			85.0527	
EI rating			85	(274)
EI band			B	

Calculation of stars for heating and DHW

Main heating energy efficiency	3.48 × (1 + 0.29 × 0.00) / 0.9000 = 3.867, stars = 4
Main heating environmental impact	0.216 × (1 + 0.29 × 0.00) / 0.9000 = 0.2400, stars = 4
Water heating energy efficiency	3.48 / 0.9000 = 3.867, stars = 4
Water heating environmental impact	0.216 / 0.9000 = 0.2400, stars = 4

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	41.8800	(1b)	x 2.4400	(2b) =	102.1872	(1b) - (3b)
First floor	41.8800	(1c)	x 2.8000	(2c) =	117.2640	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	83.7600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	219.4512	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							4 * 10 =	40.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1823 (8)
Pressure test		Yes
Measured/design AP50		5.0000
Infiltration rate		0.4323 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3674 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.9000	5.8000	5.5000	4.8000	4.5000	4.2000	4.1000	4.0000	4.5000	4.9000	5.2000	5.4000	(22)
Wind factor	1.4750	1.4500	1.3750	1.2000	1.1250	1.0500	1.0250	1.0000	1.1250	1.2250	1.3000	1.3500	(22a)
Adj infilt rate	0.5420	0.5328	0.5052	0.4409	0.4134	0.3858	0.3766	0.3674	0.4134	0.4501	0.4777	0.4960	(22b)
Effective ac	0.6469	0.6419	0.6276	0.5972	0.5854	0.5744	0.5709	0.5675	0.5854	0.6013	0.6141	0.6230	(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	
Opening Type 1			1.8900	1.3000	2.4570			(26a)
Opening Type 2 (Uw = 1.30)			14.6000	1.2357	18.0418			(27)
Heat Loss Floor 1			41.8800	0.1100	4.6068	75.0000	3141.0000	(28a)
External Wall 1	105.0600	16.4900	88.5700	0.2500	22.1425	60.0000	5314.2000	(29a)
External Roof 1	41.8800		41.8800	0.1100	4.6068	9.0000	376.9200	(30)
Total net area of external elements Aum(A, m2)			188.8200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		51.8549			(33)
Party Wall 1			45.3300	0.0000	0.0000	70.0000	3173.1000	(32)
Internal Wall 1			106.8700			9.0000	961.8300	(32c)
Internal Floor 1			41.8800			18.0000	753.8400	(32d)
Internal Ceiling 1			41.8800			18.0000	753.8400	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		14474.7300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							172.8120	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.9544	(36)
Total fabric heat loss					(33) + (36) =		65.8094	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	46.8450	46.4875	45.4518	43.2489	42.3965	41.5990	41.3454	41.0979	42.3965	43.5453	44.4710	45.1187	(38)
Heat transfer coeff	112.6543	112.2969	111.2611	109.0582	108.2058	107.4084	107.1548	106.9073	108.2058	109.3546	110.2804	110.9281	(39)
Average = Sum(39)m / 12 =												109.4763	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3450	1.3407	1.3283	1.3020	1.2919	1.2823	1.2793	1.2764	1.2919	1.3056	1.3166	1.3244	(40)
HLP (average)												1.3070	(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	2.5303 (42)
Average daily hot water use (litres/day)	94.2957 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	103.7252	99.9534	96.1816	92.4097	88.6379	84.8661	84.8661	88.6379	92.4097	96.1816	99.9534	103.7252	(44)
Energy conte	153.8215	134.5333	138.8263	121.0321	116.1332	100.2141	92.8631	106.5618	107.8345	125.6707	137.1794	148.9679	(45)
Energy content (annual)										Total = Sum(45)m =		1483.6379	(45)

Distribution loss (46)m = 0.15 x (45)m

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

	23.0732	20.1800	20.8239	18.1548	17.4200	15.0321	13.9295	15.9843	16.1752	18.8506	20.5769	22.3452	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	50.9589	46.0059	49.0131	45.5719	45.1689	41.8518	43.2468	45.1689	45.5719	49.0131	49.2921	50.9589	(61)
Total heat required for water heating calculated for each month													
	204.7804	180.5392	187.8394	166.6041	161.3021	142.0659	136.1099	151.7307	153.4064	174.6838	186.4715	199.9268	(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													
	204.7804	180.5392	187.8394	166.6041	161.3021	142.0659	136.1099	151.7307	153.4064	174.6838	186.4715	199.9268	(64)
								Total per year (kWh/year) = Sum(64)m =				2045.4602	(64)
Heat gains from water heating, kWh/month													
	63.8854	56.2338	58.4130	51.6362	49.9065	43.7841	41.6887	46.7240	47.2479	54.0388	57.9352	62.2716	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	151.8206	151.8206	151.8206	151.8206	151.8206	151.8206	151.8206	151.8206	151.8206	151.8206	151.8206	151.8206	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	51.4127	45.6643	37.1367	28.1149	21.0162	17.7428	19.1717	24.9201	33.4477	42.4695	49.5682	52.8416	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	338.9838	342.5014	333.6372	314.7663	290.9452	268.5568	253.5999	250.0823	258.9465	277.8174	301.6385	324.0270	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	52.7124	52.7124	52.7124	52.7124	52.7124	52.7124	52.7124	52.7124	52.7124	52.7124	52.7124	52.7124	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	(71)
Water heating gains (Table 5)													
	85.8674	83.6813	78.5121	71.7169	67.0787	60.8113	56.0332	62.8011	65.6221	72.6328	80.4655	83.6983	(72)
Total internal gains													
	582.5833	578.1663	555.6053	520.9174	485.3594	453.4301	435.1241	444.1228	464.3357	499.2390	537.9915	566.8862	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9700	18.1436	0.7600	0.7500	0.7700	35.6195	(76)
South	0.7300	43.2834	0.7600	0.7500	0.7700	12.4811	(78)
West	8.9000	18.1436	0.7600	0.7500	0.7700	63.7854	(80)

Solar gains	111.8859	224.1769	367.2797	519.7975	629.2588	639.7961	608.4174	524.7911	417.8309	265.5391	136.6376	95.4683	(83)
Total gains	694.4692	802.3432	922.8850	1040.7149	1114.6182	1093.2263	1043.5414	968.9139	882.1666	764.7781	674.6291	662.3545	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	35.6911	35.8047	36.1380	36.8680	37.1584	37.4343	37.5229	37.6098	37.1584	36.7681	36.4594	36.2465	
alpha	3.3794	3.3870	3.4092	3.4579	3.4772	3.4956	3.5015	3.5073	3.4772	3.4512	3.4306	3.4164	
util living area													
	0.9798	0.9680	0.9391	0.8779	0.7728	0.6292	0.5127	0.5606	0.7592	0.9157	0.9694	0.9828	(86)
MIT	19.2188	19.4101	19.8116	20.2787	20.6525	20.8771	20.9527	20.9355	20.7500	20.2502	19.6523	19.1791	(87)
Th 2	19.8058	19.8091	19.8187	19.8392	19.8472	19.8547	19.8571	19.8594	19.8472	19.8365	19.8278	19.8218	(88)
util rest of house													
	0.9752	0.9610	0.9256	0.8510	0.7238	0.5514	0.4142	0.4611	0.6918	0.8910	0.9614	0.9790	(89)
MIT 2	17.4695	17.7464	18.3259	18.9894	19.4855	19.7548	19.8292	19.8188	19.6182	18.9652	18.1126	17.4220	(90)
Living area fraction									fLA = Living area / (4) =			0.2059	(91)
MIT	17.8298	18.0890	18.6319	19.2549	19.7258	19.9859	20.0606	20.0487	19.8513	19.2298	18.4297	17.7839	(92)
Temperature adjustment												-0.1500	
adjusted MIT	17.6798	17.9390	18.4819	19.1049	19.5758	19.8359	19.9106	19.8987	19.7013	19.0798	18.2797	17.6339	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9632	0.9455	0.9056	0.8305	0.7108	0.5501	0.4190	0.4648	0.6820	0.8704	0.9463	0.9683	(94)
Useful gains	668.8802	758.5832	835.7555	864.2937	792.2944	601.3531	437.2695	450.3157	601.6582	665.6453	638.3896	641.3384	(95)
Ext temp.	3.8000	4.1000	5.7000	8.0000	10.8000	13.8000	15.7000	15.5000	13.2000	9.8000	6.5000	3.6000	(96)
Heat loss rate W													
	1563.6163	1554.0819	1422.1271	1211.0816	949.5977	648.3059	451.1818	470.2574	703.4792	1014.7884	1299.0654	1556.7505	(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													
	665.6837	534.5751	436.2605	249.6873	117.0337	0.0000	0.0000	0.0000	0.0000	259.7625	475.6866	681.0666	(98)
Space heating												3419.7559	(98)
Space heating per m2											(98) / (4) =	40.8280	(99)

8c. Space cooling requirement

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 %)	90.0000	(206)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	3799.7288	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	665.6837	534.5751	436.2605	249.6873	117.0337	0.0000	0.0000	0.0000	0.0000	259.7625	475.6866	681.0666	(98)
Space heating efficiency (main heating system 1)													
	90.0000	90.0000	90.0000	90.0000	90.0000	0.0000	0.0000	0.0000	0.0000	90.0000	90.0000	90.0000	(210)
Space heating fuel (main heating system)													
	739.6486	593.9724	484.7339	277.4303	130.0374	0.0000	0.0000	0.0000	0.0000	288.6250	528.5407	756.7407	(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													
	204.7804	180.5392	187.8394	166.6041	161.3021	142.0659	136.1099	151.7307	153.4064	174.6838	186.4715	199.9268	(64)
Efficiency of water heater												90.0000	(216)
(217)m	90.0000	90.0000	90.0000	90.0000	90.0000	90.0000	90.0000	90.0000	90.0000	90.0000	90.0000	90.0000	(217)
Fuel for water heating, kWh/month													
	227.5338	200.5991	208.7104	185.1156	179.2246	157.8510	151.2333	168.5897	170.4516	194.0931	207.1905	222.1409	(219)
Water heating fuel used												2272.7335	(219)

Annual totals kWh/year		
Space heating fuel - main system	3799.7288	(211)
Space heating fuel - secondary	0.0000	(215)
Electricity for pumps and fans:		
central heating pump	30.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	75.0000	(231)
Electricity for lighting (calculated in Appendix L)	363.1859	(232)
Total delivered energy for all uses	6510.6482	(238)

10a. Fuel costs - using BEDF prices (476)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3799.7288	3.8700	147.0495	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	2272.7335	3.8700	87.9548	(247)
Pumps and fans for heating	75.0000	18.9000	14.1750	(249)
Energy for lighting	363.1859	18.9000	68.6421	(250)
Additional standing charges			93.0000	(251)
Total energy cost			410.8214	(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	3799.7288	0.2160	820.7414	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2272.7335	0.2160	490.9104	(264)
Space and water heating			1311.6519	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	363.1859	0.5190	188.4935	(268)
Total kg/year			1539.0703	(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	3799.7288	1.2200	4635.6691	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2272.7335	1.2200	2772.7349	(264)
Space and water heating			7408.4040	(265)
Pumps and fans	75.0000	3.0700	230.2500	(267)
Energy for lighting	363.1859	3.0700	1114.9807	(268)
Primary energy kWh/year			8753.6347	(272)
Primary energy kWh/m2/year			104.5085	(273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:	B 83
Current environmental impact rating:	B 85

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

(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	Recommended
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	+ 1.2	-£ 27	-175 kg (11.4%)
U Solar photovoltaic panels	+ 10.4	-£ 314	-862 kg (63.2%)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
Solar water heating	£27	2.09 kg/m²	B 84	B 87
Solar photovoltaic panels	£314	10.29 kg/m²	A 95	A 96
Total Savings	£340	12.38 kg/m²		

Potential energy efficiency rating: A 95
Potential environmental impact rating: A 96

Fuel prices for cost data on this page from database revision number 476 TEST (01 Apr 2021)
Recommendation texts revision number 4.9c (22 Feb 2014)

Typical heating and lighting costs of this home (per year, East Pennines):

	Current	Potential	Saving
Electricity	£83	£92	-£9
Mains gas	£328	£292	£36
Space heating	£254	£254	£0
Water heating	£88	£61	£27
Lighting	£69	£69	£0
Generated (PV)	-£0	-£314	£314
Total cost of fuels	£411	£70	£341
Total cost of uses	£411	£70	£341
Delivered energy	78 kWh/m²	47 kWh/m²	30 kWh/m²
Carbon dioxide emissions	1.5 tonnes	0.5 tonnes	1.0 tonnes
CO2 emissions per m²	18 kg/m²	6 kg/m²	12 kg/m²
Primary energy	105 kWh/m²	32 kWh/m²	73 kWh/m²

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	41.8800 (1b)	x	2.4400 (2b)	=	102.1872	(1b) - (3b)
First floor	41.8800 (1c)	x	2.8000 (2c)	=	117.2640	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	83.7600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	219.4512	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							4 * 10 =	40.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1823 (8)
Pressure test		Yes
Measured/design AP50		5.0000
Infiltration rate		0.4323 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3674 (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	0.4685	0.4593	0.4501	0.4042	0.3950	0.3491	0.3491	0.3399	0.3674	0.3950	0.4134	0.4317	(22b)
Effective ac	0.6097	0.6055	0.6013	0.5817	0.5780	0.5609	0.5609	0.5578	0.5675	0.5780	0.5854	0.5932	(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	
Opening Type 1			1.8900	1.3000	2.4570			(26a)
Opening Type 2 (Uw = 1.30)			14.6000	1.2357	18.0418			(27)
Heat Loss Floor 1			41.8800	0.1100	4.6068	75.0000	3141.0000	(28a)
External Wall 1	105.0600	16.4900	88.5700	0.2500	22.1425	60.0000	5314.2000	(29a)
External Roof 1	41.8800		41.8800	0.1100	4.6068	9.0000	376.9200	(30)
Total net area of external elements Aum(A, m2)			188.8200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		51.8549			(33)
Party Wall 1			45.3300	0.0000	0.0000	70.0000	3173.1000	(32)
Internal Wall 1			106.8700			9.0000	961.8300	(32c)
Internal Floor 1			41.8800			18.0000	753.8400	(32d)
Internal Ceiling 1			41.8800			18.0000	753.8400	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		14474.7300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							172.8120	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.9544	(36)
Total fabric heat loss					(33) + (36) =		65.8094	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	44.1563	43.8477	43.5453	42.1245	41.8587	40.6213	40.6213	40.3922	41.0979	41.8587	42.3965	42.9586	(38)
Heat transfer coeff	109.9657	109.6571	109.3546	107.9339	107.6681	106.4307	106.4307	106.2015	106.9073	107.6681	108.2058	108.7680	(39)
Average = Sum(39)m / 12 =												107.9326	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3129	1.3092	1.3056	1.2886	1.2854	1.2707	1.2707	1.2679	1.2764	1.2854	1.2919	1.2986	(40)
HLP (average)												1.2886	(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	2.5303 (42)
Average daily hot water use (litres/day)	94.2957 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	103.7252	99.9534	96.1816	92.4097	88.6379	84.8661	84.8661	88.6379	92.4097	96.1816	99.9534	103.7252	(44)
Energy conte	153.8215	134.5333	138.8263	121.0321	116.1332	100.2141	92.8631	106.5618	107.8345	125.6707	137.1794	148.9679	(45)
Energy content (annual)										Total = Sum(45)m =		1483.6379	(45)

Distribution loss (46)m = 0.15 x (45)m

	23.0732	20.1800	20.8239	18.1548	17.4200	15.0321	13.9295	15.9843	16.1752	18.8506	20.5769	22.3452	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	50.9589	46.0059	49.0131	45.5719	45.1689	41.8518	43.2468	45.1689	45.5719	49.0131	49.2921	50.9589	(61)
Total heat required for water heating calculated for each month													
	204.7804	180.5392	187.8394	166.6041	161.3021	142.0659	136.1099	151.7307	153.4064	174.6838	186.4715	199.9268	(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												1.2224	(H8)
Utilisation factor												0.5587	(H9)
Collector performance factor												0.8793	(H10)
Dedicated solar storage volume												75.0000	(H11)
Effective solar volume												75.0000	(H13)
Daily hot water demand												94.2957	(H14)
Volume ratio Veff/V												0.7954	(H15)
Solar storage volume factor												0.9542	(H16)
Solar input												-850.1770	(H17)
Solar input	-24.6534	-41.1395	-70.0653	-93.9013	-116.0071	-114.0535	-112.5462	-98.3322	-77.0138	-52.5914	-29.2425	-20.6307	(63)
								Solar input (sum of months) = Sum(63)m =				-850.1770	(63)
Output from w/h													
	180.1270	139.3997	117.7741	72.7028	45.2950	28.0124	23.5637	53.3985	76.3926	122.0924	157.2289	179.2961	(64)
								Total per year (kWh/year) = Sum(64)m =				1195.2832	(64)
Heat gains from water heating, kWh/month													
	63.8854	56.2338	58.4130	51.6362	49.9065	43.7841	41.6887	46.7240	47.2479	54.0388	57.9352	62.2716	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	151.8206	151.8206	151.8206	151.8206	151.8206	151.8206	151.8206	151.8206	151.8206	151.8206	151.8206	151.8206	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	51.4127	45.6643	37.1367	28.1149	21.0162	17.7428	19.1717	24.9201	33.4477	42.4695	49.5682	52.8416	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	338.9838	342.5014	333.6372	314.7663	290.9452	268.5568	253.5999	250.0823	258.9465	277.8174	301.6385	324.0270	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	52.7124	52.7124	52.7124	52.7124	52.7124	52.7124	52.7124	52.7124	52.7124	52.7124	52.7124	52.7124	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	(71)
Water heating gains (Table 5)													
	85.8674	83.6813	78.5121	71.7169	67.0787	60.8113	56.0332	62.8011	65.6221	72.6328	80.4655	83.6983	(72)
Total internal gains													
	582.5833	578.1663	555.6053	520.9174	485.3594	453.4301	435.1241	444.1228	464.3357	499.2390	537.9915	566.8862	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9700	19.6403	0.7600	0.7500	0.7700	38.5578	(76)
South	0.7300	46.7521	0.7600	0.7500	0.7700	13.4813	(78)
West	8.9000	19.6403	0.7600	0.7500	0.7700	69.0471	(80)

Solar gains	121.0862	232.5768	374.7847	537.3700	652.7350	666.1594	635.0085	548.9560	432.5595	273.5877	150.1505	100.1381	(83)
Total gains	703.6694	810.7431	930.3900	1058.2874	1138.0943	1119.5896	1070.1326	993.0788	896.8951	772.8266	688.1420	667.0243	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	36.5638	36.6667	36.7681	37.2520	37.3440	37.7782	37.7782	37.8597	37.6098	37.3440	37.1584	36.9664	
alpha	3.4376	3.4444	3.4512	3.4835	3.4896	3.5185	3.5185	3.5240	3.5073	3.4896	3.4772	3.4644	
util living area													
	0.9769	0.9617	0.9276	0.8507	0.7251	0.5620	0.4238	0.4706	0.6968	0.8952	0.9631	0.9804	(86)
MIT	19.3600	19.5918	19.9669	20.4176	20.7471	20.9252	20.9788	20.9694	20.8378	20.3854	19.7933	19.3198	(87)
Th 2	19.8308	19.8336	19.8365	19.8498	19.8523	19.8639	19.8639	19.8660	19.8594	19.8523	19.8472	19.8420	(88)
util rest of house													
	0.9715	0.9531	0.9113	0.8178	0.6677	0.4775	0.3204	0.3635	0.6160	0.8641	0.9533	0.9759	(89)
MIT 2	17.6897	18.0242	18.5579	19.1845	19.6044	19.8098	19.8544	19.8511	19.7262	19.1614	18.3277	17.6389	(90)
Living area fraction									fLA = Living area / (4) =			0.2059	(91)
MIT	18.0337	18.3470	18.8481	19.4385	19.8397	20.0395	20.0859	20.0814	19.9551	19.4134	18.6295	17.9850	(92)
Temperature adjustment												-0.1500	
adjusted MIT	17.8837	18.1970	18.6981	19.2885	19.6897	19.8895	19.9359	19.9314	19.8051	19.2634	18.4795	17.8350	(93)

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8. Space heating requirement

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9588	0.9365	0.8908	0.7989	0.6587	0.4795	0.3272	0.3700	0.6118	0.8440	0.9370	0.9645	(94)
Useful gains	674.6522	759.2858	828.7740	845.4217	749.6980	536.8860	350.1228	367.3966	548.6814	652.2836	644.8001	643.3149	(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	1493.7397	1458.1118	1333.9169	1121.2702	860.2388	562.9665	355.0462	375.0370	609.9163	932.7754	1231.3330	1483.0551	(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	609.4011	469.6110	375.8263	198.6110	82.2424	0.0000	0.0000	0.0000	0.0000	208.6859	422.3037	624.7667	(98)

Space heating 2991.4480 (98)
Space heating per m2 (98) / (4) = 35.7145 (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 %) 90.0000 (206)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)
Space heating requirement 3323.8311 (211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	609.4011	469.6110	375.8263	198.6110	82.2424	0.0000	0.0000	0.0000	0.0000	208.6859	422.3037	624.7667	(98)
Space heating efficiency (main heating system 1)	90.0000	90.0000	90.0000	90.0000	90.0000	0.0000	0.0000	0.0000	0.0000	90.0000	90.0000	90.0000	(210)
Space heating fuel (main heating system)	677.1124	521.7901	417.5848	220.6789	91.3804	0.0000	0.0000	0.0000	0.0000	231.8732	469.2263	694.1852	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)

Water heating
Water heating requirement

	180.1270	139.3997	117.7741	72.7028	45.2950	28.0124	23.5637	53.3985	76.3926	122.0924	157.2289	179.2961	(64)
Efficiency of water heater												90.0000	(216)
(217)m	90.0000	90.0000	90.0000	90.0000	90.0000	90.0000	90.0000	90.0000	90.0000	90.0000	90.0000	90.0000	(217)
Fuel for water heating, kWh/month	200.1411	154.8886	130.8601	80.7809	50.3278	31.1249	26.1819	59.3317	84.8806	135.6582	174.6988	199.2179	(219)

Water heating fuel used 1328.0924 (219)
Annual totals kWh/year
Space heating fuel - main system 3323.8311 (211)
Space heating fuel - secondary 0.0000 (215)

Electricity for pumps and fans:
central heating pump 30.0000 (230c)
main heating flue fan 45.0000 (230e)
pump for solar water heating 50.0000 (230g)
Total electricity for the above, kWh/year 125.0000 (231)
Electricity for lighting (calculated in Appendix L) 363.1859 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV Unit 0 (0.80 * 2.50 * 1080 * 0.80) = -1727.2394 -1727.2394 (233)
Total delivered energy for all uses 3412.8701 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3323.8311	3.4800	115.6693	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1328.0924	3.4800	46.2176	(247)
Pumps and fans for heating	75.0000	13.1900	9.8925	(249)
Pump for solar water heating	50.0000	13.1900	6.5950	(249)
Energy for lighting	363.1859	13.1900	47.9042	(250)
Additional standing charges			120.0000	(251)
Energy saving/generation technologies				
PV Unit	-1727.2394	13.1900	-227.8229	(252)
Total energy cost			118.4558	(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] = 0.3864 (257)
SAP value 94.6099
SAP rating (Section 12) 95 (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

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Space heating - main system 1	3323.8311	0.2160	717.9475 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1328.0924	0.2160	286.8680 (264)
Space and water heating			1004.8155 (265)
Pumps and fans	125.0000	0.5190	64.8750 (267)
Energy for lighting	363.1859	0.5190	188.4935 (268)
Energy saving/generation technologies			
PV Unit	-1727.2394	0.5190	-896.4372 (269)
Total kg/year			361.7467 (272)
CO2 emissions per m2			4.3200 (273)
EI value			96.2353
EI rating			96 (274)
EI band			A

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	41.8800 (1b)	x	2.4400 (2b)	=	102.1872	(1b) - (3b)
First floor	41.8800 (1c)	x	2.8000 (2c)	=	117.2640	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	83.7600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	219.4512	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							4 * 10 =	40.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1823 (8)
Pressure test		Yes
Measured/design AP50		5.0000
Infiltration rate		0.4323 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3674 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.9000	5.8000	5.5000	4.8000	4.5000	4.2000	4.1000	4.0000	4.5000	4.9000	5.2000	5.4000	(22)
Wind factor	1.4750	1.4500	1.3750	1.2000	1.1250	1.0500	1.0250	1.0000	1.1250	1.2250	1.3000	1.3500	(22a)
Adj infilt rate	0.5420	0.5328	0.5052	0.4409	0.4134	0.3858	0.3766	0.3674	0.4134	0.4501	0.4777	0.4960	(22b)
Effective ac	0.6469	0.6419	0.6276	0.5972	0.5854	0.5744	0.5709	0.5675	0.5854	0.6013	0.6141	0.6230	(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	
Opening Type 1			1.8900	1.3000	2.4570			(26a)
Opening Type 2 (Uw = 1.30)			14.6000	1.2357	18.0418			(27)
Heat Loss Floor 1			41.8800	0.1100	4.6068	75.0000	3141.0000	(28a)
External Wall 1	105.0600	16.4900	88.5700	0.2500	22.1425	60.0000	5314.2000	(29a)
External Roof 1	41.8800		41.8800	0.1100	4.6068	9.0000	376.9200	(30)
Total net area of external elements Aum(A, m2)			188.8200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		51.8549			(33)
Party Wall 1			45.3300	0.0000	0.0000	70.0000	3173.1000	(32)
Internal Wall 1			106.8700			9.0000	961.8300	(32c)
Internal Floor 1			41.8800			18.0000	753.8400	(32d)
Internal Ceiling 1			41.8800			18.0000	753.8400	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		14474.7300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							172.8120	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.9544	(36)
Total fabric heat loss					(33) + (36) =		65.8094	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	46.8450	46.4875	45.4518	43.2489	42.3965	41.5990	41.3454	41.0979	42.3965	43.5453	44.4710	45.1187	(38)
Heat transfer coeff	112.6543	112.2969	111.2611	109.0582	108.2058	107.4084	107.1548	106.9073	108.2058	109.3546	110.2804	110.9281	(39)
Average = Sum(39)m / 12 =												109.4763	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3450	1.3407	1.3283	1.3020	1.2919	1.2823	1.2793	1.2764	1.2919	1.3056	1.3166	1.3244	(40)
HLP (average)												1.3070	(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	2.5303 (42)
Average daily hot water use (litres/day)	94.2957 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	103.7252	99.9534	96.1816	92.4097	88.6379	84.8661	84.8661	88.6379	92.4097	96.1816	99.9534	103.7252	(44)
Energy conte	153.8215	134.5333	138.8263	121.0321	116.1332	100.2141	92.8631	106.5618	107.8345	125.6707	137.1794	148.9679	(45)
Energy content (annual)										Total = Sum(45)m =		1483.6379	(45)

Distribution loss (46)m = 0.15 x (45)m

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

	23.0732	20.1800	20.8239	18.1548	17.4200	15.0321	13.9295	15.9843	16.1752	18.8506	20.5769	22.3452	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	50.9589	46.0059	49.0131	45.5719	45.1689	41.8518	43.2468	45.1689	45.5719	49.0131	49.2921	50.9589	(61)
Total heat required for water heating calculated for each month													
	204.7804	180.5392	187.8394	166.6041	161.3021	142.0659	136.1099	151.7307	153.4064	174.6838	186.4715	199.9268	(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												1037.4628	(H5)
Overshading factor												0.8000	(H6)
Solar energy available												1742.9374	(H7)
Adjustment factor for showers												1.0000	(H7a)
Solar-to-load ratio												1.1748	(H8)
Utilisation factor												0.5731	(H9)
Collector performance factor												0.8793	(H10)
Dedicated solar storage volume												75.0000	(H11)
Effective solar volume												75.0000	(H13)
Daily hot water demand												94.2957	(H14)
Volume ratio Veff/V												0.7954	(H15)
Solar storage volume factor												0.9542	(H16)
Solar input												-838.1036	(H17)
Solar input	-23.3791	-40.6945	-70.4573	-93.1924	-114.7310	-112.3720	-110.6232	-96.4434	-76.3323	-52.3823	-27.3102	-20.1859	(63)
								Solar input (sum of months) = Sum(63)m =				-838.1036	(63)
Output from w/h													
	181.4013	139.8447	117.3820	73.4117	46.5711	29.6939	25.4867	55.2873	77.0741	122.3014	159.1613	179.7410	(64)
								Total per year (kWh/year) = Sum(64)m =				1207.3566	(64)
Heat gains from water heating, kWh/month													
	63.8854	56.2338	58.4130	51.6362	49.9065	43.7841	41.6887	46.7240	47.2479	54.0388	57.9352	62.2716	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	151.8206	151.8206	151.8206	151.8206	151.8206	151.8206	151.8206	151.8206	151.8206	151.8206	151.8206	151.8206	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	51.4127	45.6643	37.1367	28.1149	21.0162	17.7428	19.1717	24.9201	33.4477	42.4695	49.5682	52.8416	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	338.9838	342.5014	333.6372	314.7663	290.9452	268.5568	253.5999	250.0823	258.9465	277.8174	301.6385	324.0270	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	52.7124	52.7124	52.7124	52.7124	52.7124	52.7124	52.7124	52.7124	52.7124	52.7124	52.7124	52.7124	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	-101.2137	(71)
Water heating gains (Table 5)													
	85.8674	83.6813	78.5121	71.7169	67.0787	60.8113	56.0332	62.8011	65.6221	72.6328	80.4655	83.6983	(72)
Total internal gains													
	582.5833	578.1663	555.6053	520.9174	485.3594	453.4301	435.1241	444.1228	464.3357	499.2390	537.9915	566.8862	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9700	18.1436	0.7600	0.7500	0.7700	35.6195	(76)
South	0.7300	43.2834	0.7600	0.7500	0.7700	12.4811	(78)
West	8.9000	18.1436	0.7600	0.7500	0.7700	63.7854	(80)

Solar gains	111.8859	224.1769	367.2797	519.7975	629.2588	639.7961	608.4174	524.7911	417.8309	265.5391	136.6376	95.4683	(83)
Total gains	694.4692	802.3432	922.8850	1040.7149	1114.6182	1093.2263	1043.5414	968.9139	882.1666	764.7781	674.6291	662.3545	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	35.6911	35.8047	36.1380	36.8680	37.1584	37.4343	37.5229	37.6098	37.1584	36.7681	36.4594	36.2465	
alpha	3.3794	3.3870	3.4092	3.4579	3.4772	3.4956	3.5015	3.5073	3.4772	3.4512	3.4306	3.4164	
util living area													
	0.9798	0.9680	0.9391	0.8779	0.7728	0.6292	0.5127	0.5606	0.7592	0.9157	0.9694	0.9828	(86)
MIT	19.2188	19.4101	19.8116	20.2787	20.6525	20.8771	20.9527	20.9355	20.7500	20.2502	19.6523	19.1791	(87)
Th 2	19.8058	19.8091	19.8187	19.8392	19.8472	19.8547	19.8571	19.8594	19.8472	19.8365	19.8278	19.8218	(88)
util rest of house													
	0.9752	0.9610	0.9256	0.8510	0.7238	0.5514	0.4142	0.4611	0.6918	0.8910	0.9614	0.9790	(89)
MIT 2	17.4695	17.7464	18.3259	18.9894	19.4855	19.7548	19.8292	19.8188	19.6182	18.9652	18.1126	17.4220	(90)
Living area fraction									fLA = Living area / (4) =			0.2059	(91)
MIT	17.8298	18.0890	18.6319	19.2549	19.7258	19.9859	20.0606	20.0487	19.8513	19.2298	18.4297	17.7839	(92)
Temperature adjustment												-0.1500	
adjusted MIT	17.6798	17.9390	18.4819	19.1049	19.5758	19.8359	19.9106	19.8987	19.7013	19.0798	18.2797	17.6339	(93)

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8. Space heating requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9632	0.9455	0.9056	0.8305	0.7108	0.5501	0.4190	0.4648	0.6820	0.8704	0.9463	0.9683	(94)
Useful gains	668.8802	758.5832	835.7555	864.2937	792.2944	601.3531	437.2695	450.3157	601.6582	665.6453	638.3896	641.3384	(95)
Ext temp.	3.8000	4.1000	5.7000	8.0000	10.8000	13.8000	15.7000	15.5000	13.2000	9.8000	6.5000	3.6000	(96)
Heat loss rate W	1563.6163	1554.0819	1422.1271	1211.0816	949.5977	648.3059	451.1818	470.2574	703.4792	1014.7884	1299.0654	1556.7505	(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	665.6837	534.5751	436.2605	249.6873	117.0337	0.0000	0.0000	0.0000	0.0000	259.7625	475.6866	681.0666	(98)
Space heating												3419.7559	(98)
Space heating per m2											(98) / (4) =	40.8280	(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 %)												90.0000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												3799.7288	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	665.6837	534.5751	436.2605	249.6873	117.0337	0.0000	0.0000	0.0000	0.0000	259.7625	475.6866	681.0666	(98)
Space heating efficiency (main heating system 1)	90.0000	90.0000	90.0000	90.0000	90.0000	0.0000	0.0000	0.0000	0.0000	90.0000	90.0000	90.0000	(210)
Space heating fuel (main heating system)	739.6486	593.9724	484.7339	277.4303	130.0374	0.0000	0.0000	0.0000	0.0000	288.6250	528.5407	756.7407	(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	181.4013	139.8447	117.3820	73.4117	46.5711	29.6939	25.4867	55.2873	77.0741	122.3014	159.1613	179.7410	(64)
Efficiency of water heater												90.0000	(216)
(217)m	90.0000	90.0000	90.0000	90.0000	90.0000	90.0000	90.0000	90.0000	90.0000	90.0000	90.0000	90.0000	(217)
Fuel for water heating, kWh/month	201.5570	155.3830	130.4245	81.5685	51.7457	32.9933	28.3186	61.4303	85.6379	135.8905	176.8459	199.7122	(219)
Water heating fuel used												1341.5073	(219)
Annual totals kWh/year													
Space heating fuel - main system												3799.7288	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
pump for solar water heating												50.0000	(230g)
Total electricity for the above, kWh/year												125.0000	(231)
Electricity for lighting (calculated in Appendix L)												363.1859	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 2.50 * 1037 * 0.80) =										-1659.9404		-1659.9404	(233)
Total delivered energy for all uses												3969.4816	(238)

10a. Fuel costs - using BEDF prices (476)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3799.7288	3.8700	147.0495	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1341.5073	3.8700	51.9163	(247)
Pumps and fans for heating	75.0000	18.9000	14.1750	(249)
Pump for solar water heating	50.0000	18.9000	9.4500	(249)
Energy for lighting	363.1859	18.9000	68.6421	(250)
Additional standing charges			93.0000	(251)
Energy saving/generation technologies				
PV Unit	-1659.9404	18.9000	-313.7287	(252)
Total energy cost			70.5042	(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	3799.7288	0.2160	820.7414	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1341.5073	0.2160	289.7656	(264)
Space and water heating			1110.5070	(265)
Pumps and fans	125.0000	0.5190	64.8750	(267)
Energy for lighting	363.1859	0.5190	188.4935	(268)
Energy saving/generation technologies				
PV Unit	-1659.9404	0.5190	-861.5091	(269)
Total kg/year			502.3664	(272)

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	3799.7288	1.2200	4635.6691	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1341.5073	1.2200	1636.6389	(264)
Space and water heating			6272.3081	(265)
Pumps and fans	125.0000	3.0700	383.7500	(267)
Energy for lighting	363.1859	3.0700	1114.9807	(268)
Energy saving/generation technologies				
PV Unit	-1659.9404	3.0700	-5096.0171	(269)
Primary energy kWh/year			2675.0217	(272)
Primary energy kWh/m2/year			31.9367	(273)

SAP 2012 OVERHEATING ASSESSMENT FOR New Build (As Designed) 9.92

Overheating Calculation Input Data

Dwelling type	SemiDetached House
Number of storeys	2
Cross ventilation possible	No
SAP Region	East Pennines
Front of dwelling faces	East
Overshading	Average or unknown
Thermal mass parameter	172.8 (calculated from construction elements)
Night ventilation	No
Ventilation rate during hot weather (ach)	2.50 (Windows half open)

Overheating Calculation

Summer ventilation heat loss coefficient		181.05 (P1)
Transmission heat loss coefficient		65.81 (37)
Summer heat loss coefficient		246.86 (P2)

Overhangs

Orientation	Ratio	Z_overhangs	Overhang type
East	0.000	1.000	None
South	0.000	1.000	None
West	0.000	1.000	None

Solar shading

Orientation	Z blinds	Solar access	Z overhangs	Z summer	
East	0.800	0.90	1.000	0.720	(P8)
South	0.800	0.90	1.000	0.720	(P8)
West	0.800	0.90	1.000	0.720	(P8)

[Jul]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Shading	Gains W
East	4.9700	110.2182	0.7600	0.7500	0.7200	202.3298
South	0.7300	108.0119	0.7600	0.7500	0.7200	29.1236
West	8.9000	110.2182	0.7600	0.7500	0.7200	362.3209
total:						593.7742

	Jun	Jul	Aug	
Solar gains	623	594	513	(P3)
Internal gains	450	432	441	
Total summer gains	1073	1026	954	(P5)
Summer gain/loss ratio	4.35	4.16	3.87	(P6)
Summer external temperature	14.60	16.60	16.40	
Thermal mass temperature increment (TMP = 172.8)	0.79	0.79	0.79	
Threshold temperature	19.74	21.55	21.06	(P7)
Likelihood of high internal temperature	Not significant	Slight	Slight	

Assessment of likelihood of high internal temperature: Slight

PREDICTED ENERGY ASSESSMENT

Aeratech Ltd
Air leakage testing and energy services

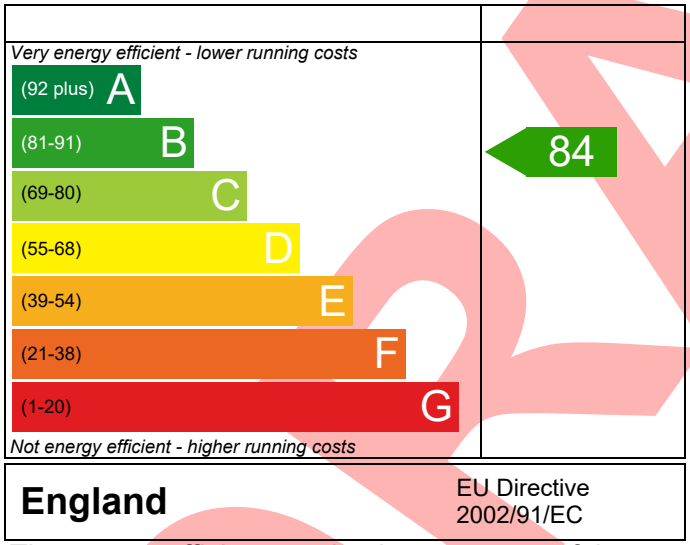
Plot 10, Abbey Road,
Shepley,
Huddersfield,
HD8 8DY

Dwelling type:	House, Detached
Date of assessment:	13/04/2021
Produced by:	Jake Eaton
Total floor area:	125.1 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 (CO_2) emissions.

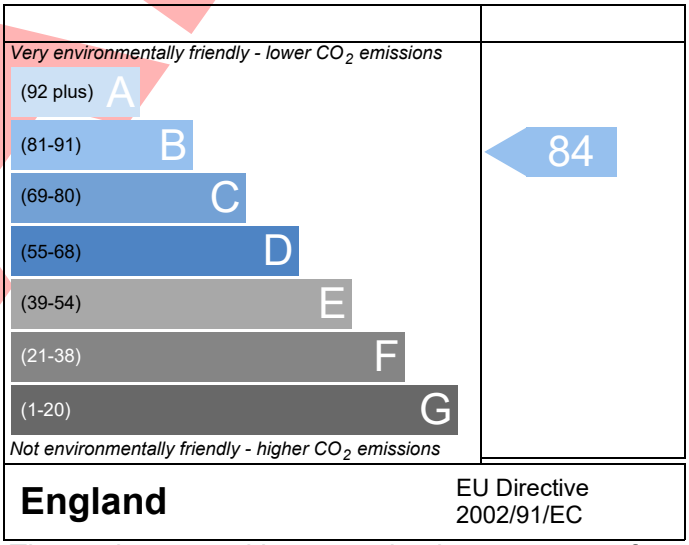
Energy Efficiency Rating



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 (CO_2) 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 (CO_2) 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)

Aeratech Ltd
Air leakage testing and energy services

Property Reference	HD8 8DY Plot 10	**Issued on Date**	13/04/2021
Assessment Reference	001	**Prop Type Ref**	Type Sandringham
Property	Plot 10, Abbey Road, Shepley, Huddersfield, HD8 8DY		

SAP Rating	84 B	**DER**	17.23	**TER**	17.23
Environmental	84 B	**% DER<TER**	0.01		
CO_2 Emissions (t/year)	2.12	**DFEE**	51.50	**TFEE**	58.62
General Requirements Compliance	Pass	**% DFEE<TFEE**	12.14		

Assessor Details	Mr. Jake Eaton, Jake Eaton, Tel: 01400283471, jake@aeratech.co.uk	**Assessor ID**	P711-0001
Client			

SUMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	17.23	$kgCO_2/m^2$	
Dwelling Carbon Dioxide Emission Rate (DER)	17.23	$kgCO_2/m^2$	Pass
	0.00 (0.0%)	$kgCO_2/m^2$	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	58.62	$kWh/m^2/yr$	
Dwelling Fabric Energy Efficiency (DFEE)	51.50	$kWh/m^2/yr$	
	-7.1 (-12.1%)	$kWh/m^2/yr$	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.25 (max. 0.30)	0.25 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.11 (max. 0.25)	0.11 (max. 0.70)	Pass
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	Pass
Openings	1.30 (max. 2.00)	1.30 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

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

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

Main heating system	Boiler system with radiators or underfloor - Mains gas Data from manufacturer rated a Efficiency: 89% Minimum: 88%		Pass
Secondary heating system	None		

5 Cylinder insulation

Hot water storage	Nominal cylinder loss: 1.79 kWh/day Permitted by DBSCG 2.30		Pass
Primary pipework insulated	Yes		Pass

6 Controls

Space heating controls	Time and temperature zone control		Pass
Hot water controls	Cylinderstat		Pass
	Independent timer for DHW		Pass
Boiler interlock	Yes		Pass

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (East Pennines)	Slight	Pass

Based on:

Overshading	Average
Windows facing North Windows facing East Windows facing West	0.73 m², No overhang 8.88 m², No overhang 7.17 m², No overhang
Air change rate	2.50 ach
Blinds/curtains	Light-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		
		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

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

10 Key features

Party wall U-value	0.00	W/m²K
Roof U-value	0.11	W/m²K
Floor U-value	0.11	W/m²K

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

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.9
Printed on 31 August 2017 at 14:23:35

Project Information:

Assessed By: Jodie Evans (STRO006643) **Building Type:** Detached House

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 117.5m²

Site Reference : New Project **Plot Reference:** House Type F - Plot 77

Address : House Type F, Plot 77, Green Lane, Rawdon, na

Client Details:

Name: Scotfield Group

Address :

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

1a TER and DER

Fuel for main heating system: Mains gas
Fuel factor: 1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER)	17.62 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	17.31 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	58.4 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	53.0 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.26 (max. 0.30)	0.26 (max. 0.70)	**OK**
Floor	0.14 (max. 0.25)	0.14 (max. 0.70)	**OK**
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	**OK**
Openings	1.42 (max. 2.00)	1.50 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main Heating system: Database: (rev 416, product index 016211):
Boiler systems with radiators or underfloor heating - mains gas
Brand name: Ideal
Model: Logic+ combi
Model qualifier: 35
(Combi)
Efficiency 88.9 % SEDBUK2009
Minimum 88.0 % **OK**

Secondary heating system: None

Regulations Compliance Report

5 Cylinder insulation

Hot water Storage:	No cylinder	

6 Controls

Space heating controls	TTZC by plumbing and electrical services	**OK**
Hot water controls:	No cylinder	
	No cylinder	
Boiler interlock:	Yes	**OK**

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (East Pennines):	Not significant	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: West	8.99m²
Windows facing: East	0.59m²
Windows facing: North	5.49m²
Windows facing: South	4.71m²
Ventilation rate:	4.00
Blinds/curtains:	None
	Closed 100% of daylight hours

10 Key features

Roofs U-value	0.11 W/m²K

SAP Input

Property Details: House Type F - Plot 77

Address:	House Type F, Plot 77, Green Lane, Rawdon, na
Located in:	England
Region:	East Pennines
UPRN:	
Date of assessment:	31 August 2017
Date of certificate:	31 August 2017
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Low
Water use <= 125 litres/person/day:	True
PCDF Version:	416

Property description:

Dwelling type:	House
Detachment:	Detached
Year Completed:	2017

Floor Location:	Floor area:	Storey height:
Floor 0	58.75 m²	2.438 m
Floor 1	58.75 m²	2.78 m

Living area:	20.39 m² (fraction 0.174)
Front of dwelling faces:	West

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
Front door	Manufacturer	Solid			PVC-U
Rear door	Manufacturer	Half glazed	low-E, En = 0.05, soft coat	No	PVC-U
Front windows	SAP 2012	Windows	low-E, En = 0.05, soft coat	No	PVC-U
Rear windows	SAP 2012	Windows	low-E, En = 0.05, soft coat	No	PVC-U
Side	SAP 2012	Windows	low-E, En = 0.05, soft coat	No	PVC-U
Side	SAP 2012	Windows	low-E, En = 0.05, soft coat	No	PVC-U

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
Front door	mm	0.7	0	1.5	2.16	1
Rear door	16mm or more mm	0.7	0.63	1.5	2.16	1
Front windows	16mm or more	0.7	0.63	1.4	8.99	1
Rear windows	16mm or more	0.7	0.63	1.4	0.59	1
Side	16mm or more	0.7	0.63	1.4	5.49	1
Side	16mm or more	0.7	0.63	1.4	4.71	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
Front door		External wall	West	0	0
Rear door		External wall	East	0	0
Front windows		External wall	West	0	0
Rear windows		External wall	East	0	0
Side		External wall	North	0	0
Side		External wall	South	0	0

Overshading:	Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External wall	163.32	24.1	139.22	0.26	0	False	N/A

SAP Input

Plane roof	58.75	0	58.75	0.11	0	N/A
Ground floor	58.75			0.14		N/A

Internal Elements
Party Elements

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0439

[Approved]

Length	Psi-value		
17.02	0.21	E2	Other lintels (including other steel lintels)
13.41	0.016	E3	Sill
38.92	0.015	E4	Jamb
31.3	0.16	E5	Ground floor (normal)
31.3	0	E6	Intermediate floor within a dwelling
12.5	0.087	E12	Gable (insulation at ceiling level)
20.87	0.057	E16	Corner (normal)
18.8	0.036	E10	Eaves (insulation at ceiling level)

Ventilation:

Pressure test: Yes (As designed)
Ventilation: Natural ventilation (extract fans)
Number of chimneys: 0
Number of open flues: 0
Number of fans: 5
Number of passive stacks: 0
Number of sides sheltered: 2
Pressure test: 5

Main heating system:

Main heating system:
Boiler systems with radiators or underfloor heating
Gas boilers and oil boilers
Fuel: mains gas
Info Source: Boiler Database
Database: (rev 416, product index 016211) Efficiency: Winter 87.3 % Summer: 89.8
Brand name: Ideal
Model: Logic+ combi
Model qualifier: 35
(Combi boiler)
Systems with radiators
Central heating pump : 2013 or later
Design flow temperature: Unknown
Boiler interlock: Yes
Weather Compensator

Main heating Control:

Main heating Control:
Time and temperature zone control by suitable arrangement of plumbing and electrical services
Control code: 2110

Secondary heating system:

Secondary heating system: None

Water heating:

Water heating:
From main heating system
Water code: 901
Fuel :mains gas
No hot water cylinder
Solar panel: False

Others:

Electricity tariff: Standard Tariff
In Smoke Control Area: Unknown

SAP Input

Conservatory:	No conservatory
Low energy lights:	100%
Terrain type:	Low rise urban / suburban
EPC language:	English
Wind turbine:	No
Photovoltaics:	None
Assess Zero Carbon Home:	No

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 31 August 2017

Property Details: House Type F - Plot 77

Dwelling type:	Detached House
Located in:	England
Region:	East Pennines
Cross ventilation possible:	Yes
Number of storeys:	2
Front of dwelling faces:	West
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Low
Night ventilation:	False
Blinds, curtains, shutters:	None
Ventilation rate during hot weather (ach):	4 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	404.66	**(P1)**
Transmission heat loss coefficient:	95.9	
Summer heat loss coefficient:	500.58	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
West (Front windows)	0	1
East (Rear windows)	0	1
North (Side)	0	1
South (Side)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
West (Front windows)	1	0.9	1	0.9	**(P8)**
East (Rear windows)	1	0.9	1	0.9	**(P8)**
North (Side)	1	0.9	1	0.9	**(P8)**
South (Side)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
West (Front windows)	0.9 x	8.99	110.22	0.63	0.7	0.9	353.95	
East (Rear windows)	0.9 x	0.59	110.22	0.63	0.7	0.9	23.23	
North (Side)	0.9 x	5.49	74.68	0.63	0.7	0.9	146.45	
South (Side)	0.9 x	4.71	108.01	0.63	0.7	0.9	181.73	
						Total	705.35	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	531.24	509.25	518.69	
Total summer gains	1270.26	1214.59	1135.34	**(P5)**
Summer gain/loss ratio	2.54	2.43	2.27	**(P6)**
Mean summer external temperature (East Pennines)	14.6	16.6	16.4	
Thermal mass temperature increment	1.3	1.3	1.3	
Threshold temperature	18.44	20.33	19.97	**(P7)**
Likelihood of high internal temperature	**Not significant**	**Not significant**	**Not significant**	

SAP 2012 Overheating Assessment

Assessment of likelihood of high internal temperature: Not significant

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.16
Printed on 18 December 2018 at 16:08:43

Project Information:

Assessed By: Jodie Evans (STRO006643) **Building Type:** Detached House

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 95.24m²

Site Reference : Phase 4 - Yeadon **Plot Reference:** House Type C - Plot 96, 97

Address : House Type C, Plot 96, 97, Green Lane Phase 4, Rawdon, na

Client Details:

Name: Scotfield Group

Address : C/O Enjoy Design

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

1a TER and DER

Fuel for main heating system: Mains gas
Fuel factor: 1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER)	19.03 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	18.52 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	59.9 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	55.5 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.27 (max. 0.30)	0.27 (max. 0.70)	**OK**
Floor	0.14 (max. 0.25)	0.14 (max. 0.70)	**OK**
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	**OK**
Openings	1.30 (max. 2.00)	1.30 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main Heating system:
Database: (rev 436, product index 017929):
Boiler systems with radiators or underfloor heating - mains gas
Brand name: Ideal
Model: LOGIC COMBI
Model qualifier: ESP1 35
(Combi)
Efficiency 89.6 % SEDBUK2009
Minimum 88.0 % **OK**

Secondary heating system: None

Regulations Compliance Report

5 Cylinder insulation

Hot water Storage:	No cylinder	

6 Controls

Space heating controls	TTZC by plumbing and electrical services	**OK**
Hot water controls:	No cylinder	
	No cylinder	
Boiler interlock:	Yes	**OK**

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (East Pennines):	Not significant	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: South	4.64m²
Windows facing: West	0.6m²
Windows facing: North	8.95m²
Windows facing: East	0.69m²
Ventilation rate:	4.00
Blinds/curtains:	None
	Closed 100% of daylight hours

10 Key features

Thermal bridging	0.035 W/m²K
Roofs U-value	0.11 W/m²K

SAP Input

Property Details: House Type C - Plot 96, 97

Address:	House Type C, Plot 96, 97, Green Lane Phase 4, Rawdon, na
Located in:	England
Region:	East Pennines
UPRN:	
Date of assessment:	28 November 2018
Date of certificate:	18 December 2018
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Calculated 182.79
Water use <= 125 litres/person/day:	True
PCDF Version:	436

Property description:

Dwelling type:	House
Detachment:	Detached
Year Completed:	2018

Floor Location:	Floor area:	Storey height:
Floor 0	47.62 m²	2.438 m
Floor 1	47.62 m²	2.782 m

Living area:	13.54 m² (fraction 0.142)
Front of dwelling faces:	South

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
Front door	Manufacturer	Half glazed	low-E, En = 0.05, soft coat	No	PVC-U
Front windows	SAP 2012	Windows	low-E, En = 0.05, soft coat	No	PVC-U
Side windows	SAP 2012	Windows	low-E, En = 0.05, soft coat	No	PVC-U
Rear windows	SAP 2012	Windows	low-E, En = 0.05, soft coat	No	PVC-U
Side	SAP 2012	Windows	low-E, En = 0.05, soft coat	No	PVC-U

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
Front door	16mm or more mm	0.7	0.63	1.3	2.15	1
Front windows	16mm or more	0.7	0.63	1.3	4.64	1
Side windows	16mm or more	0.7	0.63	1.3	0.604	1
Rear windows	16mm or more	0.7	0.63	1.3	8.95	1
Side	16mm or more	0.7	0.63	1.3	0.69	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
Front door		External wall	South	0	0
Front windows		External wall	South	0	0
Side windows		External wall	West	0	0
Rear windows		External wall	North	0	0
Side		External wall	East	0	0

Overshading:	Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External wall	147.01	17.03	129.98	0.27	0	False	60
Plane roof	47.62	0	47.62	0.11	0		9
Ground floor	47.62			0.14			75

SAP Input

Internal Elements

block	43.69	75
stud	116.44	9
ceiling	47.62	9
floor	47.62	18

Party Elements

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0347

[Approved]

Length	Psi-value		
11.92	0.052	E2	Other lintels (including other steel lintels)
8.52	0.016	E3	Sill
29.15	0.015	E4	Jamb
28.162	0.16	E5	Ground floor (normal)
28.162	-0.007	E6	Intermediate floor within a dwelling
18.056	0.087	E12	Gable (insulation at ceiling level)
26.1	0.057	E16	Corner (normal)
5.22	-0.103	E17	Corner (inverted internal area greater than external area)
10.106	0.039	E10	Eaves (insulation at ceiling level)

Ventilation:

Pressure test: Yes (As designed)
Ventilation: Natural ventilation (extract fans)
Number of chimneys: 0
Number of open flues: 0
Number of fans: 3
Number of passive stacks: 0
Number of sides sheltered: 0
Pressure test: 5

Main heating system:

Main heating system:
Boiler systems with radiators or underfloor heating
Gas boilers and oil boilers
Fuel: mains gas
Info Source: Boiler Database
Database: (rev 436, product index 017929) Efficiency: Winter 87.3 % Summer: 90.5
Brand name: Ideal
Model: LOGIC COMBI
Model qualifier: ESP1 35
(Combi boiler)
Systems with radiators
Central heating pump : 2013 or later
Design flow temperature: Unknown
Boiler interlock: Yes
Delayed start

Main heating Control:

Main heating Control:
Time and temperature zone control by suitable arrangement of plumbing and electrical services
Control code: 2110

Secondary heating system:

Secondary heating system: None

Water heating:

Water heating:
From main heating system
Water code: 901
Fuel :mains gas
No hot water cylinder

SAP Input

Solar panel: False

Others:

Electricity tariff:	Standard Tariff
In Smoke Control Area:	Unknown
Conservatory:	No conservatory
Low energy lights:	100%
Terrain type:	Low rise urban / suburban
EPC language:	English
Wind turbine:	No
Photovoltaics:	None
Assess Zero Carbon Home:	No

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 18 December 2018

Property Details: House Type C - Plot 96, 97

Dwelling type:	Detached House
Located in:	England
Region:	East Pennines
Cross ventilation possible:	Yes
Number of storeys:	2
Front of dwelling faces:	South
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Calculated 182.79
Night ventilation:	False
Blinds, curtains, shutters:	None
Ventilation rate during hot weather (ach):	4 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	328.12	**(P1)**
Transmission heat loss coefficient:	76.6	
Summer heat loss coefficient:	404.72	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
South (Front windows)	0	1
West (Side windows)	0	1
North (Rear windows)	0	1
East (Side)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
South (Front windows)	1	0.9	1	0.9	**(P8)**
West (Side windows)	1	0.9	1	0.9	**(P8)**
North (Rear windows)	1	0.9	1	0.9	**(P8)**
East (Side)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
South (Front windows)	0.9 x	4.64	108.01	0.63	0.7	0.9	179.02	
West (Side windows)	0.9 x	0.6	110.22	0.63	0.7	0.9	23.78	
North (Rear windows)	0.9 x	8.95	74.68	0.63	0.7	0.9	238.74	
East (Side)	0.9 x	0.69	110.22	0.63	0.7	0.9	27.17	
						Total	468.71	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	473.75	453.99	462.85	
Total summer gains	966.21	922.7	869.88	**(P5)**
Summer gain/loss ratio	2.39	2.28	2.15	**(P6)**
Mean summer external temperature (East Pennines)	14.6	16.6	16.4	
Thermal mass temperature increment	0.72	0.72	0.72	
Threshold temperature	17.71	19.6	19.27	**(P7)**
Likelihood of high internal temperature	**Not significant**	**Not significant**	**Not significant**	

SAP 2012 Overheating Assessment

Assessment of likelihood of high internal temperature: Not significant

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.16
Printed on 18 December 2018 at 16:08:56

Project Information:

Assessed By: Jodie Evans (STRO006643) **Building Type:** Detached House

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 133.28m²

Site Reference : Phase 4 - Yeadon **Plot Reference:** House Type G - Plot 91

Address : House Type G, Plot 91, Green Lane Phase 4, Rawdon , na

Client Details:

Name: Scotfield Group

Address : C/O Enjoy Design

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

1a TER and DER

Fuel for main heating system: Mains gas
Fuel factor: 1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER)	18.25 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	17.76 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	64.5 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	58.1 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.28 (max. 0.30)	0.36 (max. 0.70)	**OK**
Floor	0.16 (max. 0.25)	0.22 (max. 0.70)	**OK**
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	**OK**
Openings	1.32 (max. 2.00)	1.50 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main Heating system: Database: (rev 436, product index 017929):
Boiler systems with radiators or underfloor heating - mains gas
Brand name: Ideal
Model: LOGIC COMBI
Model qualifier: ESP1 35
(Combi)
Efficiency 89.6 % SEDBUK2009
Minimum 88.0 % **OK**

Secondary heating system: None

Regulations Compliance Report

5 Cylinder insulation

Hot water Storage:	No cylinder	

6 Controls

Space heating controls	TTZC by plumbing and electrical services	**OK**
Hot water controls:	No cylinder	
	No cylinder	
Boiler interlock:	Yes	**OK**

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (East Pennines):	Not significant	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: South	6.54m²
Windows facing: West	1.34m²
Windows facing: North	10.31m²
Windows facing: East	0.61m²
Ventilation rate:	4.00
Blinds/curtains:	None
	Closed 100% of daylight hours

10 Key features

Thermal bridging	0.037 W/m²K
Roofs U-value	0.11 W/m²K

SAP Input

Property Details: House Type G - Plot 91

Address:	House Type G, Plot 91, Green Lane Phase 4, Rawdon , na
Located in:	England
Region:	East Pennines
UPRN:	
Date of assessment:	11 August 2016
Date of certificate:	18 December 2018
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Calculated 158.21
Water use <= 125 litres/person/day:	True
PCDF Version:	436

Property description:

Dwelling type:	House
Detachment:	Detached
Year Completed:	2018

Floor Location:	Floor area:	Storey height:
Floor 0	59.41 m²	2.7 m
Floor 1	73.87 m²	2.52 m

Living area:	16.64 m² (fraction 0.125)
Front of dwelling faces:	South

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
Front door	Manufacturer	Solid			PVC-U
Rear door	Manufacturer	Half glazed	low-E, En = 0.05, soft coat	No	PVC-U
Garage door	Manufacturer	Solid			PVC-U
Front windows	SAP 2012	Windows	low-E, En = 0.05, soft coat	No	PVC-U
Side windows	SAP 2012	Windows	low-E, En = 0.05, soft coat	No	PVC-U
Rear windows	SAP 2012	Windows	low-E, En = 0.05, soft coat	No	PVC-U
Side	SAP 2012	Windows	low-E, En = 0.05, soft coat	No	PVC-U

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
Front door	mm	0.7	0.63	1.3	1.89	1
Rear door	16mm or more mm	0.7	0.63	1.3	2.15	1
Garage door	mm	0.7	0	1.5	1.94	1
Front windows	16mm or more	0.7	0.63	1.3	6.54	1
Side windows	16mm or more	0.7	0.63	1.3	1.34	1
Rear windows	16mm or more	0.7	0.63	1.3	10.31	1
Side	16mm or more	0.7	0.63	1.3	0.607	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
Front door		External wall	South	0	0
Rear door		External wall	North	0	0
Garage door		Garage wall (single leaf)		0	0
Front windows		External wall	South	0	0
Side windows		External wall	West	0	0
Rear windows		External wall	North	0	0
Side		External wall	East	0	0

Overshading:	Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:

SAP Input

External Elements							
External wall	165.46	22.84	142.62	0.27	0	False	60
Garage wall (single leaf)	22.23	1.94	20.29	0.41	0.33	False	9
Plane roof	73.87	0	73.87	0.11	0		9
Ground floor	59.41			0.14			75
Exposed floor	14.46			0.22			20
Internal Elements							
block	53.8						75
stud	144.2						9
ceiling	59.4						9
floor	59.4						18
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0371

	Length	Psi-value		
	16.481	0.052	E2	Other lintels (including other steel lintels)
	10.79	0.016	E3	Sill
	42.82	0.015	E4	Jamb
[Approved]	36.09	0.16	E5	Ground floor (normal)
	28	0	E6	Intermediate floor within a dwelling
	19.654	0.087	E12	Gable (insulation at ceiling level)
	23.4	0.057	E16	Corner (normal)
	5.22	-0.103	E17	Corner (inverted internal area greater than external area)
	16.158	0.039	E10	Eaves (insulation at ceiling level)
	7.81	0.079	E20	Exposed floor (normal)
	8.09	0.063	E21	Exposed floor (inverted)
[Approved]	10.8	0.09	E16	Corner (normal)
[Approved]	2.7	-0.09	E17	Corner (inverted internal area greater than external area)

Ventilation:

Pressure test: Yes (As designed)
Ventilation: Natural ventilation (extract fans)
Number of chimneys: 0
Number of open flues: 0
Number of fans: 5
Number of passive stacks: 0
Number of sides sheltered: 0
Pressure test: 5

Main heating system:

Main heating system:
Boiler systems with radiators or underfloor heating
Gas boilers and oil boilers
Fuel: mains gas
Info Source: Boiler Database
Database: (rev 436, product index 017929) Efficiency: Winter 87.3 % Summer: 90.5
Brand name: Ideal
Model: LOGIC COMBI
Model qualifier: ESP1 35
(Combi boiler)
Systems with radiators
Central heating pump : 2013 or later
Design flow temperature: Unknown
Boiler interlock: Yes
Delayed start

Main heating Control:

Main heating Control: Time and temperature zone control by suitable arrangement of plumbing and electrical

SAP Input

	services Control code: 2110

Secondary heating system:

Secondary heating system:	None

Water heating:

Water heating:	From main heating system Water code: 901 Fuel :mains gas No hot water cylinder Solar panel: False

Others:

Electricity tariff:	Standard Tariff
In Smoke Control Area:	Unknown
Conservatory:	No conservatory
Low energy lights:	100%
Terrain type:	Low rise urban / suburban
EPC language:	English
Wind turbine:	No
Photovoltaics:	None
Assess Zero Carbon Home:	No

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 18 December 2018

Property Details: House Type G - Plot 91

Dwelling type:	Detached House
Located in:	England
Region:	East Pennines
Cross ventilation possible:	Yes
Number of storeys:	2
Front of dwelling faces:	South
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Calculated 158.21
Night ventilation:	False
Blinds, curtains, shutters:	None
Ventilation rate during hot weather (ach):	4 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	457.46	**(P1)**
Transmission heat loss coefficient:	109.3	
Summer heat loss coefficient:	566.75	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
South (Front windows)	0	1
West (Side windows)	0	1
North (Rear windows)	0	1
East (Side)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
South (Front windows)	1	0.9	1	0.9	**(P8)**
West (Side windows)	1	0.9	1	0.9	**(P8)**
North (Rear windows)	1	0.9	1	0.9	**(P8)**
East (Side)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
South (Front windows)	0.9 x	6.54	108.01	0.63	0.7	0.9	252.33	
West (Side windows)	0.9 x	1.34	110.22	0.63	0.7	0.9	52.76	
North (Rear windows)	0.9 x	10.31	74.68	0.63	0.7	0.9	275.02	
East (Side)	0.9 x	0.61	110.22	0.63	0.7	0.9	23.9	
						Total	604.01	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	549.67	526.52	536.43	
Total summer gains	1183.01	1130.53	1065.52	**(P5)**
Summer gain/loss ratio	2.09	1.99	1.88	**(P6)**
Mean summer external temperature (East Pennines)	14.6	16.6	16.4	
Thermal mass temperature increment	0.89	0.89	0.89	
Threshold temperature	17.58	19.49	19.17	**(P7)**
Likelihood of high internal temperature	**Not significant**	**Not significant**	**Not significant**	

SAP 2012 Overheating Assessment

Assessment of likelihood of high internal temperature: Not significant

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.41
Printed on 17 August 2021 at 13:42:32

Project Information:

Assessed By: ()
Building Type: Detached House

Dwelling Details:

NEW DWELLING DESIGN STAGE
Total Floor Area: 116.6m²
Site Reference : Woodwalk
Plot Reference: Type C
Address :

Client Details:

Name: Cornell Group
Address :

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

1a TER and DER

Fuel for main heating system: Mains gas
Fuel factor: 1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER)	19.14 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	18.47 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	65.7 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	58.9 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.27 (max. 0.30)	0.27 (max. 0.70)	**OK**
Floor	0.14 (max. 0.25)	0.14 (max. 0.70)	**OK**
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	**OK**
Openings	1.30 (max. 2.00)	1.30 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main Heating system:
Database: (rev 480, product index 017929):
Boiler systems with radiators or underfloor heating - mains gas
Brand name: Ideal
Model: LOGIC COMBI
Model qualifier: ESP1 35
(Combi)
Efficiency 89.6 % SEDBUK2009
Minimum 88.0 % **OK**

Secondary heating system: None

Regulations Compliance Report

5 Cylinder insulation

Hot water Storage:	No cylinder	

6 Controls

Space heating controls	TTZC by plumbing and electrical services	OK
Hot water controls:	No cylinder thermostat No cylinder	
Boiler interlock:	Yes	OK

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (East Pennines):	Not significant	OK

Based on:

Overshading:	Average or unknown
Windows facing: North West	6.58m²
Windows facing: North East	1.57m²
Windows facing: South East	8.9m²
Windows facing: South West	0.76m²
Ventilation rate:	4.00
Blinds/curtains:	None
	Closed 100% of daylight hours

10 Key features

Thermal bridging	0.031 W/m²K
Roofs U-value	0.11 W/m²K

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.41
Printed on 17 August 2021 at 14:21:58

Project Information:

Assessed By: ()

Building Type: Detached House

Dwelling Details:

NEW DWELLING DESIGN STAGE

Total Floor Area: 123.7m²

Site Reference : Woodwalk

Plot Reference: Type E

Address :

Client Details:

Name: Cornell Group

Address :

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

1a TER and DER

Fuel for main heating system: Mains gas
Fuel factor: 1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER)	17.93 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	17.69 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	63.7 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	56.5 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.27 (max. 0.30)	0.27 (max. 0.70)	**OK**
Floor	0.14 (max. 0.25)	0.14 (max. 0.70)	**OK**
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	**OK**
Openings	1.30 (max. 2.00)	1.30 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main Heating system:

Database: (rev 480, product index 018047):
Boiler systems with radiators or underfloor heating - mains gas
Brand name: Ideal
Model: LOGIC SYSTEM
Model qualifier: s18
(Regular)
Efficiency 89.6 % SEDBUK2009
Minimum 88.0 % **OK**

Secondary heating system: None

Regulations Compliance Report

5 Cylinder insulation

Hot water Storage:	No cylinder	

6 Controls

Space heating controls	TTZC by plumbing and electrical services	OK
Hot water controls:	No cylinder thermostat No cylinder	
Boiler interlock:	Yes	OK

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (East Pennines):	Not significant	OK

Based on:

Overshading:	Average or unknown
Windows facing: North East	9.08m²
Windows facing: South East	0.71m²
Windows facing: South West	12.21m²
Windows facing: North West	1.38m²
Ventilation rate:	4.00
Blinds/curtains:	None
	Closed 100% of daylight hours

10 Key features

Thermal bridging	0.035 W/m²K
Roofs U-value	0.11 W/m²K

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.41
Printed on 17 August 2021 at 15:51:45

Project Information:

Assessed By: ()

Building Type: Mid-terrace House

Dwelling Details:

NEW DWELLING DESIGN STAGE

Total Floor Area: 70.8m²

Site Reference : Woodwalk

Plot Reference: Type H

Address :

Client Details:

Name: Cornell Group

Address :

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

1a TER and DER

Fuel for main heating system: Mains gas
Fuel factor: 1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER)	19.39 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	18.32 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	53.7 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	46.7 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.27 (max. 0.30)	0.27 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	0.14 (max. 0.25)	0.14 (max. 0.70)	**OK**
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	**OK**
Openings	1.30 (max. 2.00)	1.30 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main Heating system:

Database: (rev 480, product index 017929):
Boiler systems with radiators or underfloor heating - mains gas
Brand name: Ideal
Model: LOGIC COMBI
Model qualifier: ESP1 35
(Combi)
Efficiency 89.6 % SEDBUK2009
Minimum 88.0 % **OK**

Secondary heating system: None

Regulations Compliance Report

5 Cylinder insulation

Hot water Storage:	No cylinder	

6 Controls

Space heating controls	TTZC by plumbing and electrical services	OK
Hot water controls:	No cylinder thermostat No cylinder	
Boiler interlock:	Yes	OK

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (East Pennines):	Not significant	OK

Based on:

Overshading:	Average or unknown
Windows facing: South East	3.93m²
Windows facing: North West	6.63m²
Ventilation rate:	4.00
Blinds/curtains:	None
	Closed 100% of daylight hours

10 Key features

Roofs U-value	0.11 W/m²K
Party Walls U-value	0 W/m²K

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.41
Printed on 17 August 2021 at 15:02:34

Project Information:

Assessed By: ()

Building Type: End-terrace House

Dwelling Details:

NEW DWELLING DESIGN STAGE

Total Floor Area: 70.8m²

Site Reference : Woodwalk

Plot Reference: Type H

Address :

Client Details:

Name: Cornell Group

Address :

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

1a TER and DER

Fuel for main heating system: Mains gas
Fuel factor: 1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER)	21.16 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	20.28 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	63.4 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	56.6 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.27 (max. 0.30)	0.27 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	0.14 (max. 0.25)	0.14 (max. 0.70)	**OK**
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	**OK**
Openings	1.30 (max. 2.00)	1.30 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main Heating system:

Database: (rev 480, product index 017929):
Boiler systems with radiators or underfloor heating - mains gas
Brand name: Ideal
Model: LOGIC COMBI
Model qualifier: ESP1 35
(Combi)
Efficiency 89.6 % SEDBUK2009
Minimum 88.0 % **OK**

Secondary heating system: None

Regulations Compliance Report

5 Cylinder insulation

Hot water Storage:	No cylinder	

6 Controls

Space heating controls	TTZC by plumbing and electrical services	OK
Hot water controls:	No cylinder thermostat No cylinder	
Boiler interlock:	Yes	OK

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (East Pennines):	Not significant	OK

Based on:

Overshading:	Average or unknown
Windows facing: South East	3.93m²
Windows facing: South West	0.77m²
Windows facing: North West	6.63m²
Ventilation rate:	4.00
Blinds/curtains:	None
	Closed 100% of daylight hours

10 Key features

Roofs U-value	0.11 W/m²K
Party Walls U-value	0 W/m²K

Appendix B – Data Sources

Data Sources

1. National Planning Policy Framework, July 2021.
2. Barnsley Local Plan, Barnsley Metropolitan Borough Council, January 2019.
3. Proposed Site Plan, Floor Plans, Sections, Elevations, et al, Enjoy Design, August 2021
4. SAP Calculation Sheets, Enjoy Design, August 2021

Appendix C – Limitations

Limitations

The recommendations contained in this Report represent Delta-Simons professional opinions, based upon the information listed in the Report, exercising the duty of care required of an experienced Sustainability Consultant.

Delta-Simons obtained, reviewed and evaluated information in preparing this Report from the Client and others. Delta-Simons conclusions, opinions and recommendations has been determined using this information. Delta-Simons does not warrant the accuracy of the information provided to it and will not be responsible for any opinions which Delta-Simons has expressed, or conclusions which it has reached in reliance upon information which is subsequently proven to be inaccurate.

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