



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: Plot 134

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Report Issue Date: 28/03/2023

EXCELLENCE
IN ENERGY
ASSESSMENT

PREDICTED ENERGY ASSESSMENT

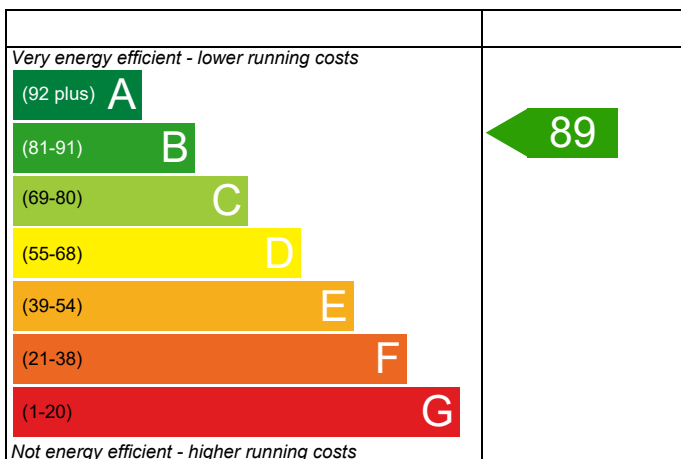
Plot 134

Dwelling type: House, Detached
Date of assessment: 28/03/2023
Produced by: Abacus Energy (UK) Ltd
Total floor area: 126.69 m²
DRRN: 2028-8723-2076

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

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

Energy Efficiency Rating

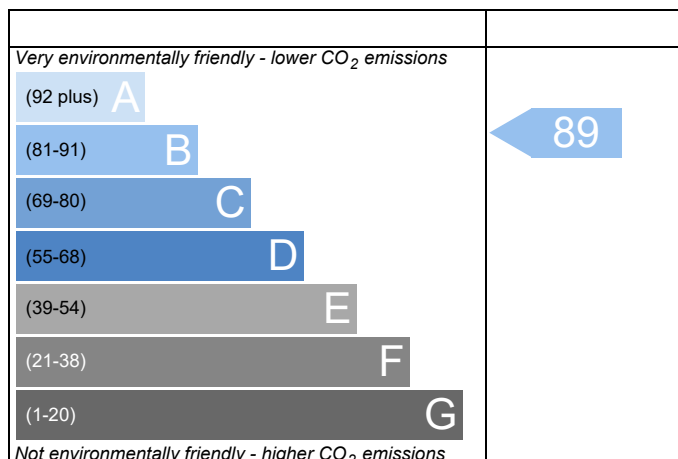


England

EU Directive
2002/91/EC

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

Environmental Impact (CO₂) Rating



England

EU Directive
2002/91/EC

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

This report has been produced by an accredited Elmhurst member whose work is subject to quality assurance audits. The data used to produce the report has been verified by the Elmhurst members' portal.

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Designed)

Property Reference	SAP 0879 Plot 134				Issued on Date	28/03/2023
Assessment Reference	Rev A	Prop Type Ref	Chalet			
Property	Plot 134					
SAP Rating		89 B	DER	13.18	TER	16.51
Environmental		89 B	% DER<TER	20.15		
CO ₂ Emissions (t/year)		1.19	DFEE	49.52	TFEE	54.22
General Requirements Compliance		Pass	% DFEE<TFEE	8.66		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com				Assessor ID	E477-0001
Client	Foreman Homes, FORE					

SUMMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	16.51	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	13.18	kgCO ₂ /m ²	Pass
	-3.33 (-20.2%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	54.22	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	49.52	kWh/m ² /yr	
	-4.7 (-8.7%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	Pass
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	Pass
Roof	0.14 (max. 0.20)	0.17 (max. 0.35)	Pass
Openings	1.20 (max. 2.00)	1.40 (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

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BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Designed)

Main heating system

Boiler system with radiators or underfloor - Mains gas
Data from database
Worcester Greenstar 36CDi Compact ErP
Combi boiler
Efficiency: 89.8% SEDBUK2009
Minimum: 88.0%

Pass

Secondary heating system

None

5 Cylinder insulation

Hot water storage

No cylinder

6 Controls

Space heating controls

Programmer, room thermostat and TRVs

Pass

Hot water controls

No cylinder

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 (Southern England)

Slight

Pass

Based on:

Overshading

Average

Windows facing North

0.96 m², No overhang

Windows facing East

11.76 m², No overhang

Windows facing West

5.03 m², No overhang

Air change rate

4.00 ach

Blinds/curtains

None

Criterion 4 – Building performance consistent with DER and DFEE rate

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

5.00 (design value) m³/(h.m²) @ 50 Pa

Maximum

10.0 m³/(h.m²) @ 50 Pa

Pass

10 Key features

Roof U-value

0.10 W/m²K

Floor U-value

0.12 W/m²K

Door U-value

1.10 W/m²K

Photovoltaic array

1.10 kW

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RECOMMENDATIONS

	Typical cost	Typical savings per year	Energy efficiency	Environmental impact	Result
Low energy lights			0	0	Already installed
Solar water heating			B 89	B 90	SAP increase too small
Photovoltaic			0	0	Already installed
Wind turbine			0	0	Not applicable
Totals	£0	£0	B 89	B 89	

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THERMAL BRIDGING

Calculation Type: New Build (As Designed)

Property Reference	SAP 0879 Plot 134	Issued on Date	28/03/2023
Assessment Reference	Rev A	Prop Type Ref	Chalet
Property	Plot 134		

SAP Rating	89 B	DER	13.18	TER	16.51
Environmental	89 B	% DER<TER	20.15		
CO ₂ Emissions (t/year)	1.19	DFEE	49.52	TFEE	54.22
General Requirements Compliance	Pass	% DFEE<TFEE	8.66		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com	Assessor ID	E477-0001
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Client	Foreman Homes, FORE
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	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.077	1.26	0.10	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.070	1.82	0.13	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.064	2.50	0.16	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.064	1.70	0.11	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.061	4.97	0.30	Birtley Supatherm
External wall	E3 Sill	Independently assessed	0.021	6.25	0.13	Knauf P5
External wall	E4 Jamb	Independently assessed	0.016	26.40	0.42	Knauf P6
External wall	E5 Ground floor (normal)	Table K1 - Default	0.320	36.92	11.81	
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.000	30.38	0.00	CD0029
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	6.35	0.38	
External wall	E24 Eaves (insulation at ceiling level - inverted)	Independently assessed	0.151	3.10	0.47	Knauf P19
External wall	E12 Gable (insulation at ceiling level)	Independently assessed	0.044	6.21	0.27	Knauf P21
External wall	E16 Corner (normal)	Independently assessed	0.039	11.92	0.46	Knauf P23
External wall	E16 Corner (normal)	Table K1 - Approved	0.090	8.35	0.75	
External wall	E17 Corner (inverted – internal area greater than external area)	Independently assessed	-0.091	2.39	-0.22	Knauf P24
External wall	E17 Corner (inverted – internal area greater than external area)	Table K1 - Approved	-0.090	2.29	-0.21	
External roof	R1 Head of roof window	Table K1 - Default	0.080	0.93	0.07	
External roof	R2 Sill of roof window	Table K1 - Default	0.060	0.93	0.06	
External roof	R3 Jamb of roof window	Table K1 - Default	0.080	2.36	0.19	
External roof	R6 Flat ceiling	Table K1 - Default	0.060	19.40	1.16	
External roof	R8 Roof to wall (rafter)	Table K1 - Default	0.060	20.47	1.23	

Total: **17.79** W/mK:
Y-Value: **0.061** W/m²K:

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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Assessment Reference	Rev A	Prop Type Ref	Chalet			
Property	Plot 134					
SAP Rating	89 B	DER	13.18	TER	16.51	
Environmental	89 B	% DER<TER	20.15			
CO ₂ Emissions (t/year)	1.19	DFEE	49.52	TFEE	54.22	
General Requirements Compliance	Pass	% DFEE<TFEE	8.66			
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com				Assessor ID	E477-0001
Client	Foreman Homes, FORE					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

DWELLING AS DESIGNED

Detached House, total floor area 127 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) 16.51 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 13.18 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)54.2 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)49.5 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	0.14 (max. 0.20)	0.17 (max. 0.35)	OK
Openings	1.20 (max. 2.00)	1.40 (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 database

Worcester Greenstar 36CDi Compact ErP

Combi boiler

Efficiency: 89.8% SEDBUK2009

Minimum: 88.0% OK

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Programmer, room thermostat and TRVs OK

Hot water controls: No cylinder

Boiler interlock Yes OK

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Southern England): Slight OK

Based on:

Overshading:	Average
Windows facing North:	0.96 m ² , No overhang
Windows facing East:	11.76 m ² , No overhang
Windows facing West:	5.03 m ² , No overhang
Air change rate:	4.00 ach
Blinds/curtains:	None

10 Key features

Roof U-value	0.10 W/m ² K
Floor U-value	0.12 W/m ² K
Door U-value	1.10 W/m ² K
Photovoltaic array	1.10 kW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	79.0400 (1b)	x 2.3900 (2b)	= 188.9056 (1b) - (3b)
First floor	47.6500 (1c)	x 2.3600 (2c)	= 112.4540 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	126.6900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 301.3596 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.0995 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3495 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3233 (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	0.4122	0.4042	0.3961	0.3557	0.3476	0.3072	0.3072	0.2991	0.3233	0.3476	0.3637	0.3799 (22b)
Effective ac	0.5850	0.5817	0.5784	0.5632	0.5604	0.5472	0.5472	0.5447	0.5523	0.5604	0.5662	0.5722 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1500	1.1000	2.3650		(26)
Windows & Fully Glazed Do (Uw = 1.20)			17.7500	1.1450	20.3244		(27)
Roof Windows (Uw = 1.40)			1.1000	1.3258	1.4583		(27a)
Ground Floor			79.0400	0.1200	9.4848	90.0000	7113.6000 (28a)
Brick and Block	120.4800	19.9000	100.5800	0.2400	24.1392	42.2200	4246.4876 (29a)
Timber Stud to Loft	29.3100		29.3100	0.2222	6.5133	9.1000	266.7210 (29a)
External Roof 1	27.0100		27.0100	0.1000	2.7010	9.1000	245.7910 (30)
Skeillins	37.8300	1.1000	36.7300	0.1700	6.2441	9.1000	334.2430 (30)
Total net area of external elements Aum(A, m ²)			293.6700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	73.2302		(33)
GF Block			98.5500			75.0000	7391.2500 (32c)
GF Timber Stud			42.4500			9.0000	382.0500 (32c)
FF Timber Stud			58.7300			9.0000	528.5700 (32c)
Internal Floor			47.6500			18.0000	857.7000 (32d)
Internal Ceiling 1			47.6500			18.0000	857.7000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	22224.1126 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							175.4212 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							17.7908 (36)
Total fabric heat loss						(33) + (36) =	91.0210 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	58.1750	57.8468	57.5252	56.0144	55.7317	54.4159	54.4159	54.1722	54.9227	55.7317	56.3035	56.9014 (38)
Average = Sum(39)m / 12 =	149.1959	148.8678	148.5461	147.0353	146.7527	145.4368	145.4368	145.1932	145.9437	146.7527	147.3245	147.9223 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1776	1.1751	1.1725	1.1606	1.1584	1.1480	1.1480	1.1461	1.1520	1.1584	1.1629	1.1676 (40)
HLP (average)												1.1606 (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												2.8859 (42)
Average daily hot water use (litres/day)												102.7392 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy conte	113.0132	108.9036	104.7940	100.6845	96.5749	92.4653	92.4653	96.5749	100.6845	104.7940	108.9036	113.0132 (44)
Energy content (annual)	167.5953	146.5799	151.2573	131.8698	126.5322	109.1877	101.1784	116.1037	117.4904	136.9237	149.4629	162.3071 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum (45)m =		1616.4883 (45)
	25.1393	21.9870	22.6886	19.7805	18.9798	16.3782	15.1768	17.4156	17.6236	20.5386	22.4194	24.3461 (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	27.5664	24.8971	27.5531	26.6457	27.5107	26.5938	27.4620	27.4936	26.6214	27.5294	26.6633	27.5581 (61)
Total heat required for water heating calculated for each month	195.1616	171.4770	178.8104	158.5155	154.0429	135.7815	128.6404	143.5973	144.1117	164.4531	176.1262	189.8651 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	195.1616	171.4770	178.8104	158.5155	154.0429	135.7815	128.6404	143.5973	144.1117	164.4531	176.1262	189.8651 (64)
Heat gains from water heating, kWh/month	62.6170	54.9621	57.1813	50.5081	48.9496	42.9534	40.5073	45.4779	45.7209	52.4095	56.3622	60.8566 (65)
										Total per year (kWh/year) = Sum (64)m =		1940.5828 (64)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	144.2931	144.2931	144.2931	144.2931	144.2931	144.2931	144.2931	144.2931	144.2931	144.2931	144.2931	144.2931 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.6553	24.5632	19.9762	15.1232	11.3048	9.5440	10.3126	13.4047	17.9918	22.8447	26.6632	28.4240 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	293.6853	296.7328	289.0531	272.7040	252.0661	232.6694	219.7113	216.6637	224.3434	240.6926	261.3304	280.7271 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.4293	37.4293	37.4293	37.4293	37.4293	37.4293	37.4293	37.4293	37.4293	37.4293	37.4293	37.4293 (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)	-115.4345	-115.4345	-115.4345	-115.4345	-115.4345	-115.4345	-115.4345	-115.4345	-115.4345	-115.4345	-115.4345	-115.4345 (71)
Water heating gains (Table 5)	84.1627	81.7888	76.8566	70.1502	65.7925	59.6574	54.4453	61.1262	63.5012	70.4429	78.2809	81.7965 (72)
Total internal gains	474.7912	472.3728	455.1738	427.2653	398.4513	371.1588	353.7571	360.4826	375.1244	403.2681	435.5624	460.2355 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North				0.9600	10.6334	0.6300	0.7000	0.7700	3.1197 (74)			
East				11.7600	19.6403	0.6300	0.7000	0.7700	70.5873 (76)			
West				5.0300	19.6403	0.6300	0.7000	0.7700	30.1917 (80)			
South				1.1000	43.9921	0.6300	0.7000	1.0000	19.2065 (82)			
Solar gains	123.1052	238.1524	387.7663	561.9011	687.5405	703.8352	670.0403	575.9126	449.5113	281.2243	152.9657	101.6049 (83)
Total gains	597.8964	710.5252	842.9402	989.1664	1085.9919	1074.9940	1023.7974	936.3952	824.6357	684.4923	588.5281	561.8404 (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	41.3776	41.4688	41.5586	41.9856	42.0665	42.4470	42.4470	42.5183	42.2996	42.0665	41.9032	41.7338
alpha	3.7585	3.7646	3.7706	3.7990	3.8044	3.8298	3.8298	3.8346	3.8200	3.8044	3.7935	3.7823
util living area	0.9964	0.9927	0.9821	0.9492	0.8715	0.7324	0.5818	0.6437	0.8635	0.9733	0.9937	0.9972 (86)
MIT	19.1730	19.3689	19.7205	20.1870	20.5950	20.8607	20.9571	20.9368	20.7140	20.1674	19.5851	19.1406 (87)
Th 2	19.9379	19.9400	19.9420	19.9517	19.9535	19.9618	19.9618	19.9634	19.9586	19.9535	19.9498	19.9460 (88)
util rest of house	0.9955	0.9909	0.9773	0.9346	0.8327	0.6515	0.4624	0.5256	0.8066	0.9632	0.9918	0.9965 (89)
MIT 2	18.2631	18.4599	18.8102	19.2738	19.6563	19.8847	19.9468	19.9389	19.7745	19.2628	18.6835	18.2368 (90)
Living area fraction									fLA = Living area / (4) =			0.1327 (91)
MIT	18.3838	18.5805	18.9310	19.3950	19.7809	20.0142	20.0808	20.0713	19.8992	19.3828	18.8031	18.3567 (92)
Temperature adjustment												0.0000
adjusted MIT	18.3838	18.5805	18.9310	19.3950	19.7809	20.0142	20.0808	20.0713	19.8992	19.3828	18.8031	18.3567 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9936	0.9876	0.9711	0.9248	0.8252	0.6560	0.4770	0.5390	0.8027	0.9557	0.9888	0.9949 (94)
Useful gains	594.0881	701.6843	818.5458	914.8088	896.1482	705.2047	488.4006	504.7226	661.9374	654.1465	581.9199	558.9983 (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	2101.2459	2036.5821	1846.5776	1543.1339	1185.8906	787.4254	506.2432	533.0478	846.3529	1288.9062	1724.1551	2094.0949 (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	1121.3254	897.0513	764.8556	452.3941	215.5683	0.0000	0.0000	0.0000	0.0000	472.2612	822.4093	1142.1118 (98)
Space heating												5887.9771 (98)
Space heating per m2										(98) / (4) =		46.4755 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													6491.7057 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1121.3254	897.0513	764.8556	452.3941	215.5683	0.0000	0.0000	0.0000	0.0000	472.2612	822.4093	1142.1118	(98)
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)
Space heating fuel (main heating system)	1236.3014	989.0312	843.2807	498.7807	237.6718	0.0000	0.0000	0.0000	0.0000	520.6849	906.7358	1259.2192	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	195.1616	171.4770	178.8104	158.5155	154.0429	135.7815	128.6404	143.5973	144.1117	164.4531	176.1262	189.8651	(64)
Efficiency of water heater	90.2737	90.2387	90.1558	89.9565	89.5116	87.9000	87.9000	87.9000	87.9000	89.9599	90.1932	87.9000	(216)
Fuel for water heating, kWh/month	216.1888	190.0260	198.3349	176.2136	172.0925	154.4727	146.3486	163.3644	163.9496	182.8072	195.2765	210.2836	(219)
Water heating fuel used												2169.3584	(219)
Annual totals kWh/year													
Space heating fuel - main system												6491.7057	(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)												488.4018	(232)
Energy saving/generation technologies (Appendices M, N and Q)													
PV Unit 0 (0.80 * 1.10 * 1080 * 1.00) =												-949.9817	(233)
Total delivered energy for all uses												8274.4843	(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	6491.7057	0.2160	1402.2084 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2169.3584	0.2160	468.5814 (264)
Space and water heating			1870.7899 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	488.4018	0.5190	253.4806 (268)
Energy saving/generation technologies			
PV Unit	-949.9817	0.5190	-493.0405 (269)
Total CO2, kg/year			1670.1549 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			13.1800 (273)

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

DER		13.1800	ZC1
Total Floor Area		126.6900	
Assumed number of occupants		2.8859	
CO2 emission factor in Table 12 for electricity displaced from grid		0.5190	
CO2 emissions from appliances, equation (L14)		13.7368	ZC2
CO2 emissions from cooking, equation (L16)		1.4860	ZC3
Total CO2 emissions		28.4028	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		28.4028	ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	79.0400 (1b)	x 2.3900 (2b)	= 188.9056 (1b) - (3b)
First floor	47.6500 (1c)	x 2.3600 (2c)	= 112.4540 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	126.6900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 301.3596 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000 / (5) = 0.1327 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3827 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3540 (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	0.4514	0.4425	0.4337	0.3894	0.3806	0.3363	0.3363	0.3275	0.3540	0.3806	0.3983	0.4160 (22b)
Effective ac	0.6019	0.5979	0.5940	0.5758	0.5724	0.5566	0.5566	0.5536	0.5627	0.5724	0.5793	0.5865 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1500	1.0000	2.1500		(26)
TER Opening Type (Uw = 1.40)			17.7500	1.3258	23.5322		(27)
TER Room Window (Uw = 1.70)			1.1000	1.5918	1.7509		(27a)
Ground Floor			79.0400	0.1300	10.2752		(28a)
Brick and Block	120.4800	19.9000	100.5800	0.1800	18.1044		(29a)
Timber Stud to Loft	29.3100		29.3100	0.1800	5.2758		(29a)
External Roof 1	27.0100		27.0100	0.1300	3.5113		(30)
Skeillins	37.8300	1.1000	36.7300	0.1300	4.7749		(30)
Total net area of external elements Aum(A, m ²)			293.6700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		69.3747		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.7641 (36)
Total fabric heat loss						(33) + (36) =	83.1388 (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	59.8556	59.4621	59.0765	57.2653	56.9264	55.3489	55.3489	55.0568	55.9565	56.9264	57.6120	58.3287 (38)
Heat transfer coeff	142.9944	142.6010	142.2154	140.4041	140.0653	138.4877	138.4877	138.1956	139.0954	140.0653	140.7508	141.4675 (39)
Average = Sum(39)m / 12 =												140.4025 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1287	1.1256	1.1225	1.1082	1.1056	1.0931	1.0931	1.0908	1.0979	1.1056	1.1110	1.1166 (40)
HLP (average)												1.1082 (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												2.8859 (42)
Average daily hot water use (litres/day)												102.7392 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	113.0132	108.9036	104.7940	100.6845	96.5749	92.4653	92.4653	96.5749	100.6845	104.7940	108.9036	113.0132 (44)
Energy conte	167.5953	146.5799	151.2573	131.8698	126.5322	109.1877	101.1784	116.1037	117.4904	136.9237	149.4629	162.3071 (45)
Energy content (annual)												Total = Sum(45)m = 1616.4883 (45)
Distribution loss (46)m = 0.15 x (45)m												
	25.1393	21.9870	22.6886	19.7805	18.9798	16.3782	15.1768	17.4156	17.6236	20.5386	22.4194	24.3461 (46)
Water storage loss:												

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Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	50.9589	46.0274	50.9589	49.3151	49.2135	45.5993	47.1193	49.2135	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	218.5542	192.6073	202.2162	181.1849	175.7457	154.7870	148.2977	165.3172	166.8054	187.8826	198.7780	213.2660	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Output from w/h	218.5542	192.6073	202.2162	181.1849	175.7457	154.7870	148.2977	165.3172	166.8054	187.8826	198.7780	213.2660	(64)
Heat gains from water heating, kWh/month	68.4651	60.2447	63.0328	56.1755	54.3753	47.7047	45.4217	50.9079	51.3943	58.2669	62.0252	66.7068	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	144.2931	144.2931	144.2931	144.2931	144.2931	144.2931	144.2931	144.2931	144.2931	144.2931	144.2931	144.2931	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.6553	24.5632	19.9762	15.1232	11.3048	9.5440	10.3126	13.4047	17.9918	22.8447	26.6632	28.4240	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	293.6853	296.7328	289.0531	272.7040	252.0661	232.6694	219.7113	216.6637	224.3434	240.6926	261.3304	280.7271	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.4293	37.4293	37.4293	37.4293	37.4293	37.4293	37.4293	37.4293	37.4293	37.4293	37.4293	37.4293	(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)	-115.4345	-115.4345	-115.4345	-115.4345	-115.4345	-115.4345	-115.4345	-115.4345	-115.4345	-115.4345	-115.4345	-115.4345	(71)
Water heating gains (Table 5)	92.0230	89.6498	84.7215	78.0215	73.0851	66.2566	61.0506	68.4245	71.3810	78.3157	86.1461	89.6597	(72)
Total internal gains	482.6516	480.2338	463.0387	435.1366	405.7440	377.7579	360.3624	367.7809	383.0041	411.1409	443.4276	468.0987	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	Specific data g or Table 6b	Specific data FF or Table 6c		Access factor Table 6d	Gains W			
North				0.9600	10.6334	0.6300	0.7000		0.7700	3.1197 (74)			
East				11.7600	19.6403	0.6300	0.7000		0.7700	70.5873 (76)			
West				5.0300	19.6403	0.6300	0.7000		0.7700	30.1917 (80)			
South				1.1000	43.9921	0.6300	0.7000		1.0000	19.2065 (82)			
Solar gains	123.1052	238.1524	387.7663	561.9011	687.5405	703.8352	670.0403	575.9126	449.5113	281.2243	152.9657	101.6049	(83)
Total gains	605.7567	718.3862	850.8050	997.0377	1093.2845	1081.5932	1030.4027	943.6935	832.5155	692.3651	596.3933	569.7036	(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	61.5263	61.6960	61.8633	62.6614	62.8130	63.5285	63.5285	63.6628	63.2510	62.8130	62.5070	62.1904		
alpha	5.1018	5.1131	5.1242	5.1774	5.1875	5.2352	5.2352	5.2442	5.2167	5.1875	5.1671	5.1460		
util living area	0.9993	0.9982	0.9937	0.9728	0.9021	0.7461	0.5753	0.6434	0.8924	0.9888	0.9985	0.9995	(86)	
MIT	19.6734	19.8244	20.0935	20.4555	20.7636	20.9406	20.9876	20.9786	20.8378	20.4230	19.9839	19.6521	(87)	
Th 2	19.9775	19.9800	19.9825	19.9941	19.9963	20.0065	20.0065	20.0083	20.0025	19.9963	19.9919	19.9873	(88)	
util rest of house	0.9991	0.9975	0.9913	0.9618	0.8628	0.6577	0.4536	0.5195	0.8333	0.9827	0.9979	0.9993	(89)	
MIT 2	18.1936	18.4163	18.8105	19.3391	19.7569	19.9655	20.0017	19.9991	19.8630	19.3005	18.6584	18.1695	(90)	
Living area fraction									fLA = Living area / (4) =			0.1327	(91)	
MIT	18.3900	18.6031	18.9807	19.4873	19.8905	20.0948	20.1325	20.1290	19.9923	19.4494	18.8343	18.3662	(92)	
Temperature adjustment												0.0000		
adjusted MIT	18.3900	18.6031	18.9807	19.4873	19.8905	20.0948	20.1325	20.1290	19.9923	19.4494	18.8343	18.3662	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains	604.8352	715.6558	840.4592	951.6723	937.8919	720.6675	483.9599	505.3076	693.0763	677.0474	594.4165	569.0733	(94)	
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)	
Heat loss rate W	2014.7847	1954.0798	1774.9512	1486.4938	1147.1982	760.9683	489.2126	515.3367	819.5932	1239.4955	1651.6094	2004.0561	(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	1049.0024	832.2209	695.2620	385.0715	155.7238	0.0000	0.0000	0.0000	0.0000	418.4614	761.1789	1067.6272	(98)	
Space heating												5364.5482	(98)	
Space heating per m2												(98) / (4) =	42.3439	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												93.4000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												5743.6276 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	1049.0024	832.2209	695.2620	385.0715	155.7238	0.0000	0.0000	0.0000	0.0000	418.4614	761.1789	1067.6272 (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)	1123.1290	891.0288	744.3919	412.2821	166.7279	0.0000	0.0000	0.0000	0.0000	448.0315	814.9667	1143.0698 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating requirement	218.5542	192.6073	202.2162	181.1849	175.7457	154.7870	148.2977	165.3172	166.8054	187.8826	198.7780	213.2660 (64)
Efficiency of water heater (217)m	88.4811	88.3124	87.9087	86.9026	84.7483	80.3000	80.3000	80.3000	80.3000	87.0089	88.1053	80.3000 (216)
Fuel for water heating, kWh/month	247.0066	218.0977	230.0299	208.4919	207.3737	192.7609	184.6796	205.8745	207.7278	215.9349	225.6141	88.5457 (217)
Water heating fuel used												240.8541 (219)
Annual totals kWh/year												2584.4456 (219)
Space heating fuel - main system												5743.6276 (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)												488.4018 (232)
Total delivered energy for all uses												8891.4751 (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	5743.6276	0.2160	1240.6236 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2584.4456	0.2160	558.2402 (264)
Space and water heating			1798.8638 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	488.4018	0.5190	253.4806 (268)
Total CO2, kg/m2/year			2091.2694 (272)
Emissions per m2 for space and water heating			14.1989 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.0008 (272b)
Emissions per m2 for pumps and fans			0.3072 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.1989 * 1.00) + 2.0008 + 0.3072, rounded to 2 d.p.			16.5100 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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 (m ²)	Storey height (m)	Volume (m ³)
Ground floor	79.0400 (1b)	x 2.3900 (2b)	= 188.9056 (1b) - (3b)
First floor	47.6500 (1c)	x 2.3600 (2c)	= 112.4540 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	126.6900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 301.3596 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000 / (5) = 0.1327 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3827 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3540 (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	0.4514	0.4425	0.4337	0.3894	0.3806	0.3363	0.3363	0.3275	0.3540	0.3806	0.3983	0.4160 (22b)
Effective ac	0.6019	0.5979	0.5940	0.5758	0.5724	0.5566	0.5566	0.5536	0.5627	0.5724	0.5793	0.5865 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1500	1.1000	2.3650		(26)
Windows & Fully Glazed Do (Uw = 1.20)			17.7500	1.1450	20.3244		(27)
Roof Windows (Uw = 1.40)			1.1000	1.3258	1.4583		(27a)
Ground Floor			79.0400	0.1200	9.4848	90.0000	7113.6000 (28a)
Brick and Block	120.4800	19.9000	100.5800	0.2400	24.1392	42.2200	4246.4876 (29a)
Timber Stud to Loft	29.3100		29.3100	0.2222	6.5133	9.1000	266.7210 (29a)
External Roof 1	27.0100		27.0100	0.1000	2.7010	9.1000	245.7910 (30)
Skeillins	37.8300	1.1000	36.7300	0.1700	6.2441	9.1000	334.2430 (30)
Total net area of external elements Aum(A, m ²)			293.6700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		73.2302		(33)
GF Block			98.5500			75.0000	7391.2500 (32c)
GF Timber Stud			42.4500			9.0000	382.0500 (32c)
FF Timber Stud			58.7300			9.0000	528.5700 (32c)
Internal Floor			47.6500			18.0000	857.7000 (32d)
Internal Ceiling 1			47.6500			9.0000	428.8500 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	21795.2626 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							172.0362 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							17.7908 (36)
Total fabric heat loss						(33) + (36) =	91.0210 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	59.8556	59.4621	59.0765	57.2653	56.9264	55.3489	55.3489	55.0568	55.9565	56.9264	57.6120	58.3287 (38)
Average = Sum(39)m / 12 =	150.8765	150.4831	150.0975	148.2863	147.9474	146.3699	146.3699	146.0777	146.9775	147.9474	148.6329	149.3496 (39)
	148.2846 (39)											
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1909	1.1878	1.1848	1.1705	1.1678	1.1553	1.1553	1.1530	1.1601	1.1678	1.1732	1.1789 (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												2.8859 (42)
Average daily hot water use (litres/day)												102.7392 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Energy conte	113.0132	108.9036	104.7940	100.6845	96.5749	92.4653	92.4653	96.5749	100.6845	104.7940	108.9036	113.0132 (44)
Energy content (annual)	167.5953	146.5799	151.2573	131.8698	126.5322	109.1877	101.1784	116.1037	117.4904	136.9237	149.4629	162.3071 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum (45)m =		1616.4883 (45)
Water storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
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	35.6140	31.1482	32.1422	28.0223	26.8881	23.2024	21.5004	24.6720	24.9667	29.0963	31.7609	34.4902 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	144.2931	144.2931	144.2931	144.2931	144.2931	144.2931	144.2931	144.2931	144.2931	144.2931	144.2931	144.2931	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.6553	24.5632	19.9762	15.1232	11.3048	9.5440	10.3126	13.4047	17.9918	22.8447	26.6632	28.4240	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	293.6853	296.7328	289.0531	272.7040	252.0661	232.6694	219.7113	216.6637	224.3434	240.6926	261.3304	280.7271	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.4293	37.4293	37.4293	37.4293	37.4293	37.4293	37.4293	37.4293	37.4293	37.4293	37.4293	37.4293	(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)	-115.4345	-115.4345	-115.4345	-115.4345	-115.4345	-115.4345	-115.4345	-115.4345	-115.4345	-115.4345	-115.4345	-115.4345	(71)
Water heating gains (Table 5)	47.8683	46.3515	43.2019	38.9199	36.1399	32.2255	28.8984	33.1613	34.6760	39.1079	44.1123	46.3579	(72)
Total internal gains	435.4968	433.9355	418.5191	393.0350	365.7987	340.7269	325.2102	329.5177	343.2991	368.9331	398.3938	421.7969	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	0.9600	10.6334	0.6300	0.7000	0.7700	3.1197 (74)
East	11.7600	19.6403	0.6300	0.7000	0.7700	70.5873 (76)
West	5.0300	19.6403	0.6300	0.7000	0.7700	30.1917 (80)
South	1.1000	43.9921	0.6300	0.7000	1.0000	19.2065 (82)

Solar gains	123.1052	238.1524	387.7663	561.9011	687.5405	703.8352	670.0403	575.9126	449.5113	281.2243	152.9657	101.6049	(83)
Total gains	558.6020	672.0879	806.2854	954.9362	1053.3393	1044.5621	995.2505	905.4303	792.8104	650.1574	551.3596	523.4018	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	40.1271	40.2320	40.3354	40.8281	40.9216	41.3626	41.3626	41.4453	41.1916	40.9216	40.7328	40.5374	
alpha	3.6751	3.6821	3.6890	3.7219	3.7281	3.7575	3.7575	3.7630	3.7461	3.7281	3.7155	3.7025	
util living area	0.9969	0.9936	0.9837	0.9529	0.8793	0.7448	0.5962	0.6600	0.8741	0.9763	0.9946	0.9976	(86)
MIT	19.0878	19.2889	19.6504	20.1342	20.5594	20.8440	20.9502	20.9269	20.6848	20.1145	19.5152	19.0587	(87)
Th 2	19.9273	19.9298	19.9322	19.9437	19.9459	19.9559	19.9559	19.9578	19.9520	19.9459	19.9415	19.9370	(88)
util rest of house	0.9962	0.9919	0.9793	0.9392	0.8422	0.6650	0.4753	0.5414	0.8202	0.9673	0.9929	0.9970	(89)
MIT 2	18.1724	18.3747	18.7355	19.2185	19.6198	19.8681	19.9381	19.9287	19.7461	19.2074	18.6097	18.1505	(90)
Living area fraction	18.2938	18.4960	18.8569	19.3400	19.7445	19.9976	20.0724	20.0612	19.8706	19.3277	18.7299	18.2710	(92)
Temperature adjustment	18.2938	18.4960	18.8569	19.3400	19.7445	19.9976	20.0724	20.0612	19.8706	19.3277	18.7299	18.2710	(93)
adjusted MIT	18.2938	18.4960	18.8569	19.3400	19.7445	19.9976	20.0724	20.0612	19.8706	19.3277	18.7299	18.2710	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9944	0.9888	0.9733	0.9293	0.8338	0.6686	0.4898	0.5544	0.8151	0.9600	0.9902	0.9956	(94)
Ext temp.	555.4954	664.5606	784.7620	887.4529	878.2446	698.3531	487.4926	501.9505	646.1975	624.1400	545.9552	521.1114	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Month fracti	2111.3422	2045.9629	1854.7417	1548.1127	1190.1571	790.0474	508.2488	534.8174	848.1512	1291.2476	1728.5818	2101.4931	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating	1157.5500	928.3024	796.0649	475.6751	232.0629	0.0000	0.0000	0.0000	0.0000	496.3281	851.4912	1175.8040	(98)
Space heating per m2												6113.2785	(98)
										(98) / (4) =		48.2538	(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	
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FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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	1375.8767	1083.1370	1110.1907	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7745	0.8463	0.8083	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1065.5878	916.6185	897.3370	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1324.3623	1264.7483	1163.8364	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	186.3176	259.0085	198.2755	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling													
Cooled fraction									FC = cooled area / (4) =			643.6017	(104)
Intermittency factor (Table 10b)												1.0000	(105)
Intermittency factor	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	46.5794	64.7521	49.5689	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling													
Space cooling per m2												160.9004	(107)
Energy for space heating												1.2700	(108)
Energy for space cooling												48.2538	(99)
Total												1.2700	(108)
Dwelling Fabric Energy Efficiency (DFEE)												49.5239	(109)
												49.5	(109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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 (m ²)	Storey height (m)	Volume (m ³)
Ground floor	79.0400 (1b)	x 2.3900 (2b)	= 188.9056 (1b) - (3b)
First floor	47.6500 (1c)	x 2.3600 (2c)	= 112.4540 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	126.6900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 301.3596 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000 / (5) = 0.1327 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3827 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3540 (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	0.4514	0.4425	0.4337	0.3894	0.3806	0.3363	0.3363	0.3275	0.3540	0.3806	0.3983	0.4160 (22b)
Effective ac	0.6019	0.5979	0.5940	0.5758	0.5724	0.5566	0.5566	0.5536	0.5627	0.5724	0.5793	0.5865 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1500	1.0000	2.1500		(26)
TER Opening Type (Uw = 1.40)			17.7500	1.3258	23.5322		(27)
TER Room Window (Uw = 1.70)			1.1000	1.5918	1.7509		(27a)
Ground Floor			79.0400	0.1300	10.2752		(28a)
Brick and Block	120.4800	19.9000	100.5800	0.1800	18.1044		(29a)
Timber Stud to Loft	29.3100		29.3100	0.1800	5.2758		(29a)
External Roof 1	27.0100		27.0100	0.1300	3.5113		(30)
Skeillins	37.8300	1.1000	36.7300	0.1300	4.7749		(30)
Total net area of external elements Aum(A, m ²)			293.6700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		69.3747		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.7641 (36)
Total fabric heat loss						(33) + (36) =	83.1388 (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	59.8556	59.4621	59.0765	57.2653	56.9264	55.3489	55.3489	55.0568	55.9565	56.9264	57.6120	58.3287 (38)
Heat transfer coeff	142.9944	142.6010	142.2154	140.4041	140.0653	138.4877	138.4877	138.1956	139.0954	140.0653	140.7508	141.4675 (39)
Average = Sum(39)m / 12 =												140.4025 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1287	1.1256	1.1225	1.1082	1.1056	1.0931	1.0931	1.0908	1.0979	1.1056	1.1110	1.1166 (40)
HLP (average)												1.1082 (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												2.8859 (42)
Average daily hot water use (litres/day)												102.7392 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	113.0132	108.9036	104.7940	100.6845	96.5749	92.4653	92.4653	96.5749	100.6845	104.7940	108.9036	113.0132 (44)
Energy conte	167.5953	146.5799	151.2573	131.8698	126.5322	109.1877	101.1784	116.1037	117.4904	136.9237	149.4629	162.3071 (45)
Energy content (annual)												Total = Sum(45)m = 1616.4883 (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:												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
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	35.6140	31.1482	32.1422	28.0223	26.8881	23.2024	21.5004	24.6720	24.9667	29.0963	31.7609	34.4902	(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	144.2931	144.2931	144.2931	144.2931	144.2931	144.2931	144.2931	144.2931	144.2931	144.2931	144.2931	144.2931	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.6553	24.5632	19.9762	15.1232	11.3048	9.5440	10.3126	13.4047	17.9918	22.8447	26.6632	28.4240	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	293.6853	296.7328	289.0531	272.7040	252.0661	232.6694	219.7113	216.6637	224.3434	240.6926	261.3304	280.7271	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.4293	37.4293	37.4293	37.4293	37.4293	37.4293	37.4293	37.4293	37.4293	37.4293	37.4293	37.4293	(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)	-115.4345	-115.4345	-115.4345	-115.4345	-115.4345	-115.4345	-115.4345	-115.4345	-115.4345	-115.4345	-115.4345	-115.4345	(71)
Water heating gains (Table 5)	47.8683	46.3515	43.2019	38.9199	36.1399	32.2255	28.8984	33.1613	34.6760	39.1079	44.1123	46.3579	(72)
Total internal gains	435.4968	433.9355	418.5191	393.0350	365.7987	340.7269	325.2102	329.5177	343.2991	368.9331	398.3938	421.7969	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W
North	0.9600	10.6334	0.6300	0.7000	0.7700	3.1197 (74)
East	11.7600	19.6403	0.6300	0.7000	0.7700	70.5873 (76)
West	5.0300	19.6403	0.6300	0.7000	0.7700	30.1917 (80)
South	1.1000	43.9921	0.6300	0.7000	1.0000	19.2065 (82)

Solar gains	123.1052	238.1524	387.7663	561.9011	687.5405	703.8352	670.0403	575.9126	449.5113	281.2243	152.9657	101.6049	(83)
Total gains	558.6020	672.0879	806.2854	954.9362	1053.3393	1044.5621	995.2505	905.4303	792.8104	650.1574	551.3596	523.4018	(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	61.5263	61.6960	61.8633	62.6614	62.8130	63.5285	63.5285	63.6628	63.2510	62.8130	62.5070	62.1904	
alpha	5.1018	5.1131	5.1242	5.1774	5.1875	5.2352	5.2352	5.2442	5.2167	5.1875	5.1671	5.1460	
util living area	0.9995	0.9987	0.9950	0.9772	0.9131	0.7636	0.5932	0.6653	0.9077	0.9915	0.9990	0.9997	(86)
MIT	19.6384	19.7902	20.0614	20.4280	20.7453	20.9336	20.9858	20.9751	20.8203	20.3931	19.9505	19.6176	(87)
Th 2	19.9775	19.9800	19.9825	19.9941	19.9963	20.0065	20.0065	20.0083	20.0025	19.9963	19.9919	19.9873	(88)
util rest of house	0.9994	0.9982	0.9931	0.9677	0.8766	0.6762	0.4690	0.5396	0.8534	0.9868	0.9985	0.9996	(89)
MIT 2	18.7246	18.8783	19.1505	19.5208	19.8179	19.9747	20.0027	20.0008	19.8945	19.4922	19.0482	18.7117	(90)
Living area fraction									fLA = Living area / (4) =			0.1327	(91)
MIT	18.8458	18.9993	19.2714	19.6412	19.9410	20.1019	20.1331	20.1301	20.0173	19.6117	19.1679	18.8319	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8458	18.9993	19.2714	19.6412	19.9410	20.1019	20.1331	20.1301	20.0173	19.6117	19.1679	18.8319	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9991	0.9975	0.9913	0.9634	0.8742	0.6854	0.4855	0.5561	0.8544	0.9842	0.9980	0.9994	(94)
Ext temp.	558.1025	670.4360	799.2490	919.9812	920.8007	715.9913	483.1766	503.5538	677.4065	639.8944	550.2465	523.0710	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Month fracti	2079.9730	2010.5740	1816.2847	1508.1098	1154.2708	761.9476	489.2948	515.4798	823.0700	1262.2286	1698.5651	2069.9423	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating per m2	1132.2717	900.5727	756.6746	423.4526	173.7018	0.0000	0.0000	0.0000	0.0000	463.0167	826.7894	1150.8723	(98)
												5827.3517	(98)
												45.9969	(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	1301.7847	1024.8092	1050.2865	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8468	0.9137	0.8797	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1102.2977	936.3499	923.8977	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1324.3623	1264.7483	1163.8364	0.0000	0.0000	0.0000	0.0000	(103)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Month fraction	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	159.8937	244.3284	178.5144	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												582.7365 (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	39.9734	61.0821	44.6286	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												145.6841 (107)
Space cooling per m2												1.1499 (108)
Energy for space heating												45.9969 (99)
Energy for space cooling												1.1499 (108)
Total												47.1469 (109)
Target Fabric Energy Efficiency (TFEE)												54.2 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	79.0400 (1b)	x 2.3900 (2b)	= 188.9056 (1b) - (3b)
First floor	47.6500 (1c)	x 2.3600 (2c)	= 112.4540 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	126.6900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 301.3596 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.0995 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3495 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3233 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	4.7000	4.6000	4.3000	4.3000	4.0000	4.0000	3.9000	4.0000	4.5000	4.4000	4.7000 (22)
Wind factor	1.2750	1.1750	1.1500	1.0750	1.0750	1.0000	1.0000	0.9750	1.0000	1.1250	1.1000	1.1750 (22a)
Adj infilt rate	0.4122	0.3799	0.3718	0.3476	0.3476	0.3233	0.3233	0.3152	0.3233	0.3637	0.3557	0.3799 (22b)
Effective ac	0.5850	0.5722	0.5691	0.5604	0.5604	0.5523	0.5523	0.5497	0.5523	0.5662	0.5632	0.5722 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1500	1.1000	2.3650		(26)
Windows & Fully Glazed Do (Uw = 1.20)			17.7500	1.1450	20.3244		(27)
Roof Windows (Uw = 1.40)			1.1000	1.3258	1.4583		(27a)
Ground Floor			79.0400	0.1200	9.4848	90.0000	7113.6000 (28a)
Brick and Block	120.4800	19.9000	100.5800	0.2400	24.1392	42.2200	4246.4876 (29a)
Timber Stud to Loft	29.3100		29.3100	0.2222	6.5133	9.1000	266.7210 (29a)
External Roof 1	27.0100		27.0100	0.1000	2.7010	9.1000	245.7910 (30)
Skeillins	37.8300	1.1000	36.7300	0.1700	6.2441	9.1000	334.2430 (30)
Total net area of external elements Aum(A, m ²)			293.6700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	73.2302		(33)
GF Block			98.5500			75.0000	7391.2500 (32c)
GF Timber Stud			42.4500			9.0000	382.0500 (32c)
FF Timber Stud			58.7300			9.0000	528.5700 (32c)
Internal Floor			47.6500			18.0000	857.7000 (32d)
Internal Ceiling 1			47.6500			18.0000	857.7000 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 22224.1126 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							175.4212 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							17.7908 (36)
Total fabric heat loss							(33) + (36) = 91.0210 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	58.1750	56.9014	56.5992	55.7317	55.7317	54.9227	54.9227	54.6660	54.9227	56.3035	56.0144	56.9014 (38)
Average = Sum(39)m / 12 =	149.1959	147.9223	147.6202	146.7527	146.7527	145.9437	145.9437	145.6870	145.9437	147.3245	147.0353	147.9223 (39)
												147.0037 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1776	1.1676	1.1652	1.1584	1.1584	1.1520	1.1520	1.1499	1.1520	1.1629	1.1606	1.1676 (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												2.8859 (42)
Average daily hot water use (litres/day)												102.7392 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Energy conte	113.0132	108.9036	104.7940	100.6845	96.5749	92.4653	92.4653	96.5749	100.6845	104.7940	108.9036	113.0132 (44)
Energy content (annual)	167.5953	146.5799	151.2573	131.8698	126.5322	109.1877	101.1784	116.1037	117.4904	136.9237	149.4629	162.3071 (45)
Distribution loss (46)m = 0.15 x (45)m	25.1393	21.9870	22.6886	19.7805	18.9798	16.3782	15.1768	17.4156	17.6236	20.5386	22.4194	24.3461 (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	27.5664	24.8971	27.5531	26.6457	27.5107	26.5938	27.4620	27.4936	26.6214	27.5294	26.6633	27.5581 (61)
Total heat required for water heating calculated for each month	195.1616	171.4770	178.8104	158.5155	154.0429	135.7815	128.6404	143.5973	144.1117	164.4531	176.1262	189.8651 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	195.1616	171.4770	178.8104	158.5155	154.0429	135.7815	128.6404	143.5973	144.1117	164.4531	176.1262	189.8651 (64)
RHI water heating demand	62.6170	54.9621	57.1813	50.5081	48.9496	42.9534	40.5073	45.4779	45.7209	52.4095	56.3622	60.8566 (65)
Heat gains from water heating, kWh/month												1941 (64)
												1941 (64)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	173.1518	173.1518	173.1518	173.1518	173.1518	173.1518	173.1518	173.1518	173.1518	173.1518	173.1518	173.1518	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.1383	61.4081	49.9404	37.8081	28.2620	23.8600	25.7815	33.5118	44.9795	57.1118	66.6579	71.0599	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	438.3362	442.8848	431.4226	407.0208	376.2181	347.2678	327.9272	323.3787	334.8409	359.2426	390.0454	418.9957	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.2010	55.2010	55.2010	55.2010	55.2010	55.2010	55.2010	55.2010	55.2010	55.2010	55.2010	55.2010	(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)	-115.4345	-115.4345	-115.4345	-115.4345	-115.4345	-115.4345	-115.4345	-115.4345	-115.4345	-115.4345	-115.4345	-115.4345	(71)
Water heating gains (Table 5)	84.1627	81.7888	76.8566	70.1502	65.7925	59.6574	54.4453	61.1262	63.5012	70.4429	78.2809	81.7965	(72)
Total internal gains	707.5555	702.0000	674.1379	630.8974	586.1909	546.7035	524.0724	533.9350	559.2399	602.7155	650.9025	687.7704	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W
North	0.9600	13.8645	0.6300	0.7000	0.7700	4.0677 (74)
East	11.7600	25.9136	0.6300	0.7000	0.7700	93.1339 (76)
West	5.0300	25.9136	0.6300	0.7000	0.7700	39.8353 (80)
South	1.1000	56.7026	0.6300	0.7000	1.0000	24.7558 (82)

Solar gains	161.7927	267.4714	432.1914	635.2068	740.3521	819.3842	761.6895	670.0250	530.4093	333.8493	199.2222	127.4834 (83)
Total gains	869.3482	969.4713	1106.3293	1266.1042	1326.5430	1366.0877	1285.7619	1203.9600	1089.6493	936.5649	850.1246	815.2538 (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	41.3776	41.7338	41.8193	42.0665	42.0665	42.2996	42.2996	42.3742	42.2996	41.9032	41.9856	41.7338	
alpha	3.7585	3.7823	3.7880	3.8044	3.8044	3.8200	3.8200	3.8249	3.8200	3.7935	3.7990	3.7823	
util living area	0.9844	0.9764	0.9512	0.8858	0.7619	0.5614	0.4110	0.4360	0.6985	0.9084	0.9713	0.9870 (86)	
MIT	19.5817	19.7281	20.0624	20.4661	20.7850	20.9512	20.9888	20.9864	20.8890	20.5120	20.0063	19.5624 (87)	
Th 2	19.9379	19.9460	19.9479	19.9535	19.9535	19.9586	19.9586	19.9602	19.9586	19.9498	19.9517	19.9460 (88)	
util rest of house	0.9805	0.9706	0.9389	0.8573	0.7035	0.4705	0.2996	0.3190	0.6099	0.8768	0.9626	0.9837 (89)	
MIT 2	18.6690	18.8193	19.1473	19.5333	19.8122	19.9367	19.9559	19.9569	19.9013	19.5828	19.1000	18.6564 (90)	
Living area fraction	18.7901	18.9399	19.2687	19.6571	19.9413	20.0713	20.0930	20.0935	20.0323	19.7061	19.2202	18.7766 (91)	
MIT	18.7901	18.9399	19.2687	19.6571	19.9413	20.0713	20.0930	20.0935	20.0323	19.7061	19.2202	18.7766 (92)	
Temperature adjustment												0.0000	
adjusted MIT	18.7901	18.9399	19.2687	19.6571	19.9413	20.0713	20.0930	20.0935	20.0323	19.7061	19.2202	18.7766 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	847.4023	933.9830	1027.7599	1073.4343	932.2511	656.8719	404.1418	402.6998	672.0757	812.8218	811.6173	797.8470 (95)	
Ext temp.	5.4000	5.7000	7.3000	9.6000	12.6000	15.4000	17.3000	17.3000	15.0000	11.8000	8.4000	5.5000 (96)	
Heat loss rate W	1997.7547	1958.4805	1766.8172	1475.9001	1077.3536	681.7524	407.6134	406.9756	734.4372	1164.7666	1590.9582	1963.9104 (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	855.8621	688.4623	549.8587	289.7754	107.9562	0.0000	0.0000	0.0000	0.0000	261.8469	561.1255	867.5512 (98)	
Space heating												4182.4384 (98)	
RHI space heating demand												4182 (98)	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	79.0400 (1b)	x 2.3900 (2b)	= 188.9056 (1b) - (3b)
First floor	47.6500 (1c)	x 2.3600 (2c)	= 112.4540 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	126.6900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 301.3596 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.0995 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3495 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3233 (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	0.4122	0.4042	0.3961	0.3557	0.3476	0.3072	0.3072	0.2991	0.3233	0.3476	0.3637	0.3799 (22b)
Effective ac	0.5850	0.5817	0.5784	0.5632	0.5604	0.5472	0.5472	0.5447	0.5523	0.5604	0.5662	0.5722 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1500	1.1000	2.3650		(26)
Windows & Fully Glazed Do (Uw = 1.20)			17.7500	1.1450	20.3244		(27)
Roof Windows (Uw = 1.40)			1.1000	1.3258	1.4583		(27a)
Ground Floor			79.0400	0.1200	9.4848	90.0000	7113.6000 (28a)
Brick and Block	120.4800	19.9000	100.5800	0.2400	24.1392	42.2200	4246.4876 (29a)
Timber Stud to Loft	29.3100		29.3100	0.2222	6.5133	9.1000	266.7210 (29a)
External Roof 1	27.0100		27.0100	0.1000	2.7010	9.1000	245.7910 (30)
Skeillins	37.8300	1.1000	36.7300	0.1700	6.2441	9.1000	334.2430 (30)
Total net area of external elements Aum(A, m ²)			293.6700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	73.2302		(33)
GF Block			98.5500			75.0000	7391.2500 (32c)
GF Timber Stud			42.4500			9.0000	382.0500 (32c)
FF Timber Stud			58.7300			9.0000	528.5700 (32c)
Internal Floor			47.6500			18.0000	857.7000 (32d)
Internal Ceiling 1			47.6500			18.0000	857.7000 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 22224.1126 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							175.4212 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							17.7908 (36)
Total fabric heat loss							(33) + (36) = 91.0210 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	58.1750	57.8468	57.5252	56.0144	55.7317	54.4159	54.4159	54.1722	54.9227	55.7317	56.3035	56.9014 (38)
Average = Sum(39)m / 12 =	149.1959	148.8678	148.5461	147.0353	146.7527	145.4368	145.4368	145.1932	145.9437	146.7527	147.3245	147.9223 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1776	1.1751	1.1725	1.1606	1.1584	1.1480	1.1480	1.1461	1.1520	1.1584	1.1629	1.1676 (40)
HLP (average)												1.1606 (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												2.8859 (42)
Average daily hot water use (litres/day)												102.7392 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												

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Energy conte	113.0132	108.9036	104.7940	100.6845	96.5749	92.4653	92.4653	96.5749	100.6845	104.7940	108.9036	113.0132 (44)
Energy content (annual)	167.5953	146.5799	151.2573	131.8698	126.5322	109.1877	101.1784	116.1037	117.4904	136.9237	149.4629	162.3071 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum (45)m =		1616.4883 (45)
	25.1393	21.9870	22.6886	19.7805	18.9798	16.3782	15.1768	17.4156	17.6236	20.5386	22.4194	24.3461 (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	27.5664	24.8971	27.5531	26.6457	27.5107	26.5938	27.4620	27.4936	26.6214	27.5294	26.6633	27.5581 (61)
Total heat required for water heating calculated for each month	195.1616	171.4770	178.8104	158.5155	154.0429	135.7815	128.6404	143.5973	144.1117	164.4531	176.1262	189.8651 (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	195.1616	171.4770	178.8104	158.5155	154.0429	135.7815	128.6404	143.5973	144.1117	164.4531	176.1262	189.8651 (64)
								Total per year (kWh/year) =	Sum (64)m =			1940.5828 (64)
Heat gains from water heating, kWh/month	62.6170	54.9621	57.1813	50.5081	48.9496	42.9534	40.5073	45.4779	45.7209	52.4095	56.3622	60.8566 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	173.1518	173.1518	173.1518	173.1518	173.1518	173.1518	173.1518	173.1518	173.1518	173.1518	173.1518	173.1518 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	69.1383	61.4081	49.9404	37.8081	28.2620	23.8600	25.7815	33.5118	44.9795	57.1118	66.6579	71.0599 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	438.3362	442.8848	431.4226	407.0208	376.2181	347.2678	327.9272	323.3787	334.8409	359.2426	390.0454	418.9957 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	55.2010	55.2010	55.2010	55.2010	55.2010	55.2010	55.2010	55.2010	55.2010	55.2010	55.2010	55.2010 (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)												
	-115.4345	-115.4345	-115.4345	-115.4345	-115.4345	-115.4345	-115.4345	-115.4345	-115.4345	-115.4345	-115.4345	-115.4345 (71)
Water heating gains (Table 5)												
	84.1627	81.7888	76.8566	70.1502	65.7925	59.6574	54.4453	61.1262	63.5012	70.4429	78.2809	81.7965 (72)
Total internal gains	707.5555	702.0000	674.1379	630.8974	586.1909	546.7035	524.0724	533.9350	559.2399	602.7155	650.9025	687.7704 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d	Gains W		
North				0.9600	10.6334	0.6300	0.7000		0.7700	3.1197 (74)		
East				11.7600	19.6403	0.6300	0.7000		0.7700	70.5873 (76)		
West				5.0300	19.6403	0.6300	0.7000		0.7700	30.1917 (80)		
South				1.1000	43.9921	0.6300	0.7000		1.0000	19.2065 (82)		
Solar gains	123.1052	238.1524	387.7663	561.9011	687.5405	703.8352	670.0403	575.9126	449.5113	281.2243	152.9657	101.6049 (83)
Total gains	830.6607	940.1524	1061.9042	1192.7985	1273.7314	1250.5387	1194.1127	1109.8476	1008.7512	883.9398	803.8682	789.3753 (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	41.3776	41.4688	41.5586	41.9856	42.0665	42.4470	42.4470	42.5183	42.2996	42.0665	41.9032	41.7338
alpha	3.7585	3.7646	3.7706	3.7990	3.8044	3.8298	3.8298	3.8346	3.8200	3.8044	3.7935	3.7823
util living area	0.9892	0.9819	0.9635	0.9154	0.8183	0.6635	0.5119	0.5644	0.7918	0.9432	0.9823	0.9910 (86)
MIT	19.3907	19.5789	19.9089	20.3350	20.6877	20.9019	20.9722	20.9597	20.7981	20.3296	19.7832	19.3551 (87)
Th 2	19.9379	19.9400	19.9420	19.9517	19.9535	19.9618	19.9618	19.9634	19.9586	19.9535	19.9498	19.9460 (88)
util rest of house	0.9866	0.9775	0.9545	0.8937	0.7715	0.5807	0.4014	0.4525	0.7226	0.9241	0.9773	0.9889 (89)
MIT 2	18.4793	18.6671	18.9934	19.4108	19.7322	19.9099	19.9526	19.9487	19.8363	19.4154	18.8788	18.4500 (90)
Living area fraction									fLA = Living area / (4) =			0.1327 (91)
MIT	18.6002	18.7881	19.1148	19.5334	19.8590	20.0415	20.0878	20.0828	19.9639	19.5367	18.9988	18.5701 (92)
Temperature adjustment												0.0000
adjusted MIT	18.6002	18.7881	19.1148	19.5334	19.8590	20.0415	20.0878	20.0828	19.9639	19.5367	18.9988	18.5701 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9822	0.9713	0.9455	0.8834	0.7667	0.5876	0.4154	0.4662	0.7230	0.9145	0.9712	0.9850 (94)
Useful gains	815.8571	913.1326	1003.9923	1053.6797	976.5675	734.8046	496.0904	517.3631	729.2945	808.3437	780.7086	777.5627 (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	2133.5305	2067.4941	1873.8854	1563.4923	1197.3505	791.3916	507.2611	534.7195	855.8020	1311.4802	1752.9810	2125.6627 (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	980.3490	775.7309	647.2005	367.0651	164.2625	0.0000	0.0000	0.0000	0.0000	374.3335	700.0361	1002.9864 (98)
Space heating												5011.9641 (98)
Space heating per m2												(98) / (4) = 39.5608 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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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 %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													5525.8700 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	980.3490	775.7309	647.2005	367.0651	164.2625	0.0000	0.0000	0.0000	0.0000	374.3335	700.0361	1002.9864	(98)
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)
Space heating fuel (main heating system)	1080.8699	855.2712	713.5617	404.7024	181.1053	0.0000	0.0000	0.0000	0.0000	412.7161	771.8149	1105.8285	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	195.1616	171.4770	178.8104	158.5155	154.0429	135.7815	128.6404	143.5973	144.1117	164.4531	176.1262	189.8651	(64)
Efficiency of water heater (217)m	90.2229	90.1800	90.0788	89.8369	89.3230	87.9000	87.9000	87.9000	87.9000	89.8266	90.1229	87.9000	(216)
Fuel for water heating, kWh/month	216.3106	190.1498	198.5044	176.4481	172.4560	154.4727	146.3486	163.3644	163.9496	183.0784	195.4289	210.3945	(219)
Water heating fuel used												2170.9059	(219)
Annual totals kWh/year													
Space heating fuel - main system												5525.8700	(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)												488.4018	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.10 * 1080 * 1.00) =												-949.9817	(233)
Total delivered energy for all uses												7310.1960	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	5525.8700	3.4800	192.3003 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2170.9059	3.4800	75.5475 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	488.4018	13.1900	64.4202 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-949.9817	13.1900	-125.3026 (252)
Total energy cost			336.8579 (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] =	0.8240 (257)
SAP value		88.5046
SAP rating (Section 12)		89 (258)
SAP band		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	5525.8700	0.2160	1193.5879 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2170.9059	0.2160	468.9157 (264)
Space and water heating			1662.5036 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	488.4018	0.5190	253.4806 (268)
Energy saving/generation technologies			
PV Unit	-949.9817	0.5190	-493.0405 (269)
Total kg/year			1461.8687 (272)
CO2 emissions per m2			11.5400 (273)
EI value			88.5905
EI rating			89 (274)
EI band			B

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Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9070 = 3.837$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9070 = 0.2381$, stars = 4
Water heating energy efficiency	$3.48 / 0.8929 = 3.898$, stars = 4
Water heating environmental impact	$0.216 / 0.8929 = 0.2419$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	79.0400 (1b)	x 2.3900 (2b)	= 188.9056 (1b) - (3b)
First floor	47.6500 (1c)	x 2.3600 (2c)	= 112.4540 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	126.6900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 301.3596 (5)

2. Ventilation rate

										main	secondary	other	total	m3 per hour			
										heating	heating						
Number of chimneys										0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues										0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans																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) =	0.0995 (8)
Pressure test										Yes							
Measured/design AP50										5.0000							
Infiltration rate										0.3495 (18)							
Number of sides sheltered										1 (19)							
Shelter factor										(20) = 1 - [0.075 x (19)] =							0.9250 (20)
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =							0.3233 (21)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec					
Wind speed	5.1000	4.7000	4.6000	4.3000	4.3000	4.0000	4.0000	3.9000	4.0000	4.5000	4.4000	4.7000	(22)				
Wind factor	1.2750	1.1750	1.1500	1.0750	1.0750	1.0000	1.0000	0.9750	1.0000	1.1250	1.1000	1.1750	(22a)				
Adj infilt rate	0.4122	0.3799	0.3718	0.3476	0.3476	0.3233	0.3233	0.3152	0.3233	0.3637	0.3557	0.3799	(22b)				
Effective ac	0.5850	0.5722	0.5691	0.5604	0.5604	0.5523	0.5523	0.5497	0.5523	0.5662	0.5632	0.5722	(25)				

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1500	1.1000	2.3650		(26)
Windows & Fully Glazed Do (Uw = 1.20)			17.7500	1.1450	20.3244		(27)
Roof Windows (Uw = 1.40)			1.1000	1.3258	1.4583		(27a)
Ground Floor			79.0400	0.1200	9.4848	90.0000	7113.6000 (28a)
Brick and Block	120.4800	19.9000	100.5800	0.2400	24.1392	42.2200	4246.4876 (29a)
Timber Stud to Loft	29.3100		29.3100	0.2222	6.5133	9.1000	266.7210 (29a)
External Roof 1	27.0100		27.0100	0.1000	2.7010	9.1000	245.7910 (30)
Skeillins	37.8300	1.1000	36.7300	0.1700	6.2441	9.1000	334.2430 (30)
Total net area of external elements Aum(A, m ²)			293.6700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	73.2302		(33)
GF Block			98.5500			75.0000	7391.2500 (32c)
GF Timber Stud			42.4500			9.0000	382.0500 (32c)
FF Timber Stud			58.7300			9.0000	528.5700 (32c)
Internal Floor			47.6500			18.0000	857.7000 (32d)
Internal Ceiling 1			47.6500			18.0000	857.7000 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 22224.1126 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							175.4212 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							17.7908 (36)
Total fabric heat loss						(33) + (36) =	91.0210 (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	58.1750	56.9014	56.5992	55.7317	55.7317	54.9227	54.9227	54.6660	54.9227	56.3035	56.0144	56.9014 (38)
Heat transfer coeff	149.1959	147.9223	147.6202	146.7527	146.7527	145.9437	145.9437	145.6870	145.9437	147.3245	147.0353	147.9223 (39)
Average = Sum(39)m / 12 =												147.0037 (39)
HLP	1.1776	1.1676	1.1652	1.1584	1.1584	1.1520	1.1520	1.1499	1.1520	1.1629	1.1606	1.1676 (40)
HLP (average)												1.1603 (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 2.8859 (42)
Average daily hot water use (litres/day) 102.7392 (43)

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Energy conte	113.0132	108.9036	104.7940	100.6845	96.5749	92.4653	92.4653	96.5749	100.6845	104.7940	108.9036	113.0132 (44)
Energy content (annual)	167.5953	146.5799	151.2573	131.8698	126.5322	109.1877	101.1784	116.1037	117.4904	136.9237	149.4629	162.3071 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum (45)m =		1616.4883 (45)
	25.1393	21.9870	22.6886	19.7805	18.9798	16.3782	15.1768	17.4156	17.6236	20.5386	22.4194	24.3461 (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	27.5664	24.8971	27.5531	26.6457	27.5107	26.5938	27.4620	27.4936	26.6214	27.5294	26.6633	27.5581 (61)
Total heat required for water heating calculated for each month	195.1616	171.4770	178.8104	158.5155	154.0429	135.7815	128.6404	143.5973	144.1117	164.4531	176.1262	189.8651 (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	195.1616	171.4770	178.8104	158.5155	154.0429	135.7815	128.6404	143.5973	144.1117	164.4531	176.1262	189.8651 (64)
Heat gains from water heating, kWh/month	62.6170	54.9621	57.1813	50.5081	48.9496	42.9534	40.5073	45.4779	45.7209	52.4095	56.3622	60.8566 (65)
								Total per year (kWh/year) =	Sum(64)m =			1940.5828 (64)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	173.1518	173.1518	173.1518	173.1518	173.1518	173.1518	173.1518	173.1518	173.1518	173.1518	173.1518	173.1518 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.1383	61.4081	49.9404	37.8081	28.2620	23.8600	25.7815	33.5118	44.9795	57.1118	66.6579	71.0599 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	438.3362	442.8848	431.4226	407.0208	376.2181	347.2678	327.9272	323.3787	334.8409	359.2426	390.0454	418.9957 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.2010	55.2010	55.2010	55.2010	55.2010	55.2010	55.2010	55.2010	55.2010	55.2010	55.2010	55.2010 (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)	-115.4345	-115.4345	-115.4345	-115.4345	-115.4345	-115.4345	-115.4345	-115.4345	-115.4345	-115.4345	-115.4345	-115.4345 (71)
Water heating gains (Table 5)	84.1627	81.7888	76.8566	70.1502	65.7925	59.6574	54.4453	61.1262	63.5012	70.4429	78.2809	81.7965 (72)
Total internal gains	707.5555	702.0000	674.1379	630.8974	586.1909	546.7035	524.0724	533.9350	559.2399	602.7155	650.9025	687.7704 (73)

6. Solar gains

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

North				0.9600	13.8645		0.6300		0.7000		0.7700		4.0677 (74)
East				11.7600	25.9136		0.6300		0.7000		0.7700		93.1339 (76)
West				5.0300	25.9136		0.6300		0.7000		0.7700		39.8353 (80)
South				1.1000	56.7026		0.6300		0.7000		1.0000		24.7558 (82)

Solar gains	161.7927	267.4714	432.1914	635.2068	740.3521	819.3842	761.6895	670.0250	530.4093	333.8493	199.2222	127.4834	(83)
Total gains	869.3482	969.4713	1106.3293	1266.1042	1326.5430	1366.0877	1285.7619	1203.9600	1089.6493	936.5649	850.1246	815.2538	(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	41.3776	41.7338	41.8193	42.0665	42.0665	42.2996	42.2996	42.3742	42.2996	41.9032	41.9856	41.7338
alpha	3.7585	3.7823	3.7880	3.8044	3.8044	3.8200	3.8200	3.8249	3.8200	3.7935	3.7990	3.7823
util living area	0.9844	0.9764	0.9512	0.8858	0.7619	0.5614	0.4110	0.4360	0.6985	0.9084	0.9713	0.9870 (86)
MIT	19.5817	19.7281	20.0624	20.4661	20.7850	20.9512	20.9888	20.9864	20.8890	20.5120	20.0063	19.5624 (87)
Th 2	19.9379	19.9460	19.9479	19.9535	19.9535	19.9586	19.9586	19.9602	19.9586	19.9498	19.9517	19.9460 (88)
util rest of house	0.9805	0.9706	0.9389	0.8573	0.7035	0.4705	0.2996	0.3190	0.6099	0.8768	0.9626	0.9837 (89)
MIT 2	18.6690	18.8193	19.1473	19.5333	19.8122	19.9367	19.9559	19.9569	19.9013	19.5828	19.1000	18.6564 (90)
Living area fraction									fLA = Living area / (4) =			0.1327 (91)
MIT	18.7901	18.9399	19.2687	19.6571	19.9413	20.0713	20.0930	20.0935	20.0323	19.7061	19.2202	18.7766 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7901	18.9399	19.2687	19.6571	19.9413	20.0713	20.0930	20.0935	20.0323	19.7061	19.2202	18.7766 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9748	0.9634	0.9290	0.8478	0.7028	0.4808	0.3143	0.3345	0.6168	0.8679	0.9547	0.9786 (94)
Useful gains	847.4023	933.9830	1027.7599	1073.4343	932.2511	656.8719	404.1418	402.6998	672.0757	812.8218	811.6173	797.8470 (95)
Ext temp.	5.4000	5.7000	7.3000	9.6000	12.6000	15.4000	17.3000	17.3000	15.0000	11.8000	8.4000	5.5000 (96)
Heat loss rate W	1997.7547	1958.4805	1766.8172	1475.9001	1077.3536	681.7524	407.6134	406.9756	734.4372	1164.7666	1590.9582	1963.9104 (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	855.8621	688.4623	549.8587	289.7754	107.9562	0.0000	0.0000	0.0000	0.0000	261.8469	561.1255	867.5512 (98)
Space heating												4182.4384 (98)
Space heating per m2										(98) / (4) =		33.0132 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													4611.2882 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	855.8621	688.4623	549.8587	289.7754	107.9562	0.0000	0.0000	0.0000	0.0000	261.8469	561.1255	867.5512	(98)
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)
Space heating fuel (main heating system)	943.6187	759.0544	606.2389	319.4878	119.0256	0.0000	0.0000	0.0000	0.0000	288.6956	618.6610	956.5063	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	195.1616	171.4770	178.8104	158.5155	154.0429	135.7815	128.6404	143.5973	144.1117	164.4531	176.1262	189.8651	(64)
Efficiency of water heater (217)m	90.1667	90.1275	89.9965	89.6898	89.0325	87.9000	87.9000	87.9000	87.9000	89.5990	90.0150	87.9000	(216)
Fuel for water heating, kWh/month	216.4454	190.2605	198.6860	176.7376	173.0187	154.4727	146.3486	163.3644	163.9496	183.5435	195.6632	210.5304	(219)
Water heating fuel used												2173.0205	(219)
Annual totals kWh/year													
Space heating fuel - main system												4611.2882	(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)												488.4018	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.10 * 1234 * 1.00) =										-1086.3291		-1086.3291	(233)
Total delivered energy for all uses												6261.3814	(238)

10a. Fuel costs - using BEDF prices (513)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	4611.2882	9.7400	449.1395 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2173.0205	9.7400	211.6522 (247)
Pumps and fans for heating	75.0000	36.8500	27.6375 (249)
Energy for lighting	488.4018	36.8500	179.9761 (250)
Additional standing charges			104.0000 (251)
Energy saving/generation technologies			
PV Unit	-1086.3291	36.8500	-400.3123 (252)
Total energy cost			572.0930 (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	4611.2882	0.2160	996.0382 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2173.0205	0.2160	469.3724 (264)
Space and water heating			1465.4107 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	488.4018	0.5190	253.4806 (268)
Energy saving/generation technologies			
PV Unit	-1086.3291	0.5190	-563.8048 (269)
Total kg/year			1194.0114 (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	4611.2882	1.2200	5625.7716 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2173.0205	1.2200	2651.0850 (264)
Space and water heating			8276.8566 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	488.4018	3.0700	1499.3936 (268)
Energy saving/generation technologies			
PV Unit	-1086.3291	3.0700	-3335.0303 (269)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Primary energy kWh/year
Primary energy kWh/m²/year

6671.4699 (272)
52.6598 (273)

SAP 2012 EPC IMPROVEMENTS

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

(For testing purposes):

A	Not considered
B	Not considered
C	Not considered
D	Not considered
E	Low energy lighting
F	Already installed
G	Not considered
H	Not considered
I	Not considered
J	Not considered
K	Not considered
M	Not considered
N	Solar water heating
O	SAP increase too small
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U	Solar photovoltaic panels
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
L2	Not applicable
Q3	Not considered
O3	Not considered

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

Measures omitted - SAP change or cost saving too small:
N Solar water heating + 1.0 -£ 83 -199 kg (16.7%)

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

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

Fuel prices for cost data on this page from database revision number 513 TEST (28 Feb 2023)
Recommendation texts revision number 4.9c (22 Feb 2014)

Typical heating and lighting costs of this home (per year, Southern England):

	Current	Potential	Saving
Electricity	£208	£208	£0
Mains gas	£765	£765	£0
Space heating	£581	£581	£0
Water heating	£212	£212	£0
Lighting	£180	£180	£0
Generated (PV)	-£400	-£400	£0
Total cost of fuels	£573	£573	£0
Total cost of uses	£573	£573	£0
Delivered energy	49 kWh/m ²	49 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	1.2 tonnes	1.2 tonnes	0.0 tonnes
CO2 emissions per m ²	9 kg/m ²	9 kg/m ²	0 kg/m ²
Primary energy	53 kWh/m ²	53 kWh/m ²	0 kWh/m ²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

No improvements selected / applicable

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0879 Plot 134	Issued on Date	28/03/2023
Assessment Reference	Rev A	Prop Type Ref	Chalet
Project	Plot 134		
Calculation Type	New Build (As Designed)		

SAP Rating	89 B	DER	13.18	TER	16.51
Environmental	89 B	% DER<TER	20.15		
CO ₂ Emissions (t/year)	1.19	DFEE	49.52	TTEE	54.22
General Requirements Compliance	Pass	% DFEE<TTEE	8.66		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com	Assessor ID	E477-0001
Client	Foreman Homes, FORE		

Building Elements

Roof 000002 - Mineral Wool between and above

Roof Type: Pitched Roof, insulated flat ceiling

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)	Density (kg/m ³)	Heat Cap. (J/kgK)
Ext surface				0.0400			
Layer 1	Earthwool Loft Roll 40						
	Main construction	150	0.0400	3.7500	100.00		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 2	Earthwool Loft Roll 40						
	Main construction	200	0.0400	5.0000	100.00		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 3	Earthwool Loft Roll 40						
	Main construction	100	0.0400	2.5000	87.50		
	Main construction	100	0.1300	0.7692	12.50		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 4	Plasterboard, standard						
	Main construction	12.5	0.2100	0.0595	100.00	700	1000
Int surface				0.1000			

Total resistance:	Upper limit = 11.200 m ² K/W	Lower limit = 10.901 m ² K/W	Average = 11.050 m ² K/W
	Total correction = 0.0065 m ² K/W	U-value (unrounded) = 0.1 W/m ² K	

Unheated space: None

Total thickness: 463 mm

U-value: 0.10 W/m² K

Kappa: 9.10 kJ/m² K

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0879 Plot 134	Issued on Date	28/03/2023
Assessment Reference	Rev A	Prop Type Ref	Chalet
Project	Plot 134		
Calculation Type	New Build (As Designed)		

SAP Rating	89 B	DER	13.18	TER	16.51
Environmental	89 B	% DER<TER	20.15		
CO ₂ Emissions (t/year)	1.19	DFEE	49.52	TFEE	54.22
General Requirements Compliance	Pass	% DFEE<TFEE	8.66		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com	Assessor ID	E477-0001
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Client	Foreman Homes, FORE
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Building Elements

Roof 000004 - Insulation between and below

Roof Type: Pitched Roof, insulated sloping ceiling

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)	Density (kg/m ³)	Heat Cap. (J/kgK)
Ext surface				0.0400			
Layer 1	Tiling						
	Main construction	30	1.5000	0.0200	100.00		
Layer 2	airspace/timber battens						
	Main construction	25	0.2500	0.1000	91.59		
	Main construction	25	0.1563	0.1600	8.41		
	Corrections - Cavity Unventilated, Emissivity: Normal						
Layer 3	Breather membrane						
	Main construction	1	0.0000	0.0000	100.00		
Layer 4	Standard cavity						
	Main construction	50	0.2948	0.1696	87.50		
	Main construction	50	0.1300	0.3846	12.50		
	Corrections - Cavity Unventilated, Emissivity: Low Emissivity (BR443)						
Layer 5	Celotex GA4000						
	Main construction	100	0.0220	4.5455	87.50		
	Main construction	100	0.1300	0.7692	12.50		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 6	Celotex GA4000						
	Main construction	50	0.0220	2.2727	100.00		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 7	Plasterboard, standard						
	Main construction	12.5	0.2100	0.0595	100.00	700	1000
Int surface				0.1000			

Total resistance:	Upper limit = 6.480 m ² K/W	Lower limit = 5.595 m ² K/W	Average = 6.037 m ² K/W
	Total correction = 0.0036 m ² K/W	U-value (unrounded) = 0.17 W/m ² K	

Unheated space: None

Total thickness: 269 mm

U-value: 0.17 W/m² K

Kappa: 9.10 kJ/m² K

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0879 Plot 134	Issued on Date	28/03/2023
Assessment Reference	Rev A	Prop Type Ref	Chalet
Project	Plot 134		
Calculation Type	New Build (As Designed)		

SAP Rating	89 B	DER	13.18	TER	16.51
Environmental	89 B	% DER<TER	20.15		
CO ₂ Emissions (t/year)	1.19	DFEE	49.52	TFEE	54.22
General Requirements Compliance	Pass	% DFEE<TFEE	8.66		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com	Assessor ID	E477-0001
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Client	Foreman Homes, FORE
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Building Elements

Wall 000001

Wall Type: Standard Wall

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)	Density (kg/m ³)	Heat Cap. (J/kgK)
Ext surface				0.0400			
Layer 1	Brick, outer leaf						
	Main construction	102	0.7700	0.1325	82.81		
	Main construction	102	0.9407	0.1084	17.19		
Layer 2	Supafil 34						
	Main construction	100	0.0340	2.9412	100.00		
	Corrections - Air Gap: Level 0, Fasteners: None or plastic						
Layer 3	Supabloc						
	Main construction	100	0.1100	0.9091	94.04	460	1000
	Main construction	100	0.8803	0.1136	5.96	460	1000
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 4	airspace/plaster dabs						
	Main construction	15	0.0882	0.1700	80.00		
	Main construction	15	0.0882	0.1700	20.00		
	Corrections - Cavity Unventilated, Emissivity: Normal						
Layer 5	Plasterboard, standard						
	Main construction	12.5	0.2100	0.0595	100.00	700	1000
Int surface				0.1300			

Total resistance:	Upper limit = 4.321 m ² K/W	Lower limit = 4.110 m ² K/W	Average = 4.215 m ² K/W
	Total correction = 0.0002 m ² K/W	U-value (unrounded) = 0.24 W/m ² K	

Unheated space: None		
Total thickness: 330 mm	U-value: 0.24 W/m² K	Kappa: 42.22 kJ/m² K

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0879 Plot 134	Issued on Date	28/03/2023
Assessment Reference	Rev A	Prop Type Ref	Chalet
Project	Plot 134		
Calculation Type	New Build (As Designed)		

SAP Rating	89 B	DER	13.18	TER	16.51
Environmental	89 B	% DER<TER	20.15		
CO ₂ Emissions (t/year)	1.19	DFEE	49.52	TFEE	54.22
General Requirements Compliance	Pass	% DFEE<TFEE	8.66		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com	Assessor ID	E477-0001
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Client	Foreman Homes, FORE
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Building Elements

Wall Stud Wall to Loft

Wall Type: Standard Wall

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)	Density (kg/m ³)	Heat Cap. (J/kgK)
Ext surface				0.0400			
Layer 1	Celotex GA4000						
	Main construction	100	0.0220	4.5455	83.85	30	1400
	Main construction	100	0.1300	0.7692	16.15	30	1400
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 2	Celotex TB4000						
	Main construction	20	0.0220	0.9091	100.00	30	1400
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 3	Plasterboard, standard						
	Main construction	12.5	0.2100	0.0595	100.00	700	1000
Int surface				0.1300			

Total resistance:	Upper limit = 4.307 m ² K/W	Lower limit = 3.674 m ² K/W	Average = 3.991 m ² K/W
	Total correction = 0.0046 m ² K/W	U-value (unrounded) = 0.25 W/m ² K	

Unheated space: None

Total thickness: 133 mm

U-value: 0.25 W/m² K

Kappa: 9.10 kJ/m² K

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0879 Plot 134	Issued on Date	28/03/2023
Assessment Reference	Rev A	Prop Type Ref	Chalet
Project	Plot 134		
Calculation Type	New Build (As Designed)		

SAP Rating	89 B	DER	13.18	TER	16.51
Environmental	89 B	% DER<TER	20.15		
CO ₂ Emissions (t/year)	1.19	DFEE	49.52	TFEE	54.22
General Requirements Compliance	Pass	% DFEE<TFEE	8.66		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com	Assessor ID	E477-0001
Client	Foreman Homes, FORE		

Building Elements

Floor 000003

Floor Type: Suspended Floor

Area = 64.80 m², Perimeter = 34.61 m, Wall thickness = 275.00 mm, Soil: Unknown

Depth of underfloor space below ground: 0.200 m Floor wind shielding: Average (suburban)

Floor height above ground: h = 0.200 m

U-value of walls above ground: U_w = 1.500 m

Ventilation openings per perimeter length: e = 0.0015 %

Mean wind speed: v = 5.000 m/s

Resistance on solum: R_g = 0.000 m²K/W

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)	Density (kg/m ³)	Heat Cap. (J/kgK)
Ext surface				0.1700			
Layer 1	EPS 200 Lower portion						
	Main construction	55	0.0340	1.6176	80.65		
	Main construction	55	2.0000	0.0275	19.35		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 2	EPS Upper portion						
	Main construction	100	0.0340	2.9412	87.10		
	Main construction	100	2.0000	0.0500	12.90		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 3	Grey EPS 100 Topsheet						
	Main construction	155	0.0300	5.1667	100.00	15	1450
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 4	Screed						
	Main construction	75	1.1500	0.0652	100.00	1200	1000
Int surface				0.1700			

Total resistance: Upper limit = 9.271 m² K/W Lower limit = 6.052 m² K/W Average = 7.661 m² K/W
Total correction = 0.0046 m² K/W U-value (unrounded) = 0.12 W/m² K

Unheated space: None

Total thickness: 385 mm

U-value: 0.12 W/m² K

Kappa: 90.00 kJ/m² K

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Property Reference	SAP 0879 Plot 134	Issued on Date	28/03/2023
Assessment Reference	Rev A	Prop Type Ref	Chalet
Property	Plot 134		

SAP Rating	89 B	DER	13.18	TER	16.51
Environmental	89 B	% DER<TER	20.15		
CO ₂ Emissions (t/year)	1.19	DFEE	49.52	TFEE	54.22
General Requirements Compliance	Pass	% DFEE<TFEE	8.66		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com	Assessor ID	E477-0001
Client	Foreman Homes, FORE		

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

Orientation	West
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Suburban
1.0 Property Type	House, Detached
2.0 Number of Storeys	2
3.0 Date Built	2022
4.0 Sheltered Sides	1
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements		Heat Loss Perimeter	Internal Floor Area	Average Storey Height
	Ground Floor:	36.92 m	79.04 m ²	2.39 m
	1st Storey:	30.38 m	47.65 m ²	2.36 m

7.0 Living Area	16.81	m ²
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8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	175.42	kJ/m ² K

9.0 External Walls			U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Description	Type	Construction				
Brick and Block	Cavity Wall	Other	0.24	42.22	120.48	100.58
Timber Stud to Loft	Timber Frame	Other	0.25	9.10	29.31	29.31

9.2 Internal Walls		Construction	Kappa (kJ/m ² K)	Area (m ²)
Description				
GF Block		Dense block, plasterboard on dabs	75.00	98.55
GF Timber Stud		Plasterboard on timber frame	9.00	42.45
FF Timber Stud		Plasterboard on timber frame	9.00	58.73

10.0 External Roofs			U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Description	Type	Construction				
External Roof 1	External Plane Roof	Other	0.10	9.10	27.01	27.01
Skeillins	External Slope Roof	Other	0.17	9.10	37.83	36.73

10.2 Internal Ceilings

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Ceiling 1	Plasterboard ceiling, carpeted chipboard floor	9.00	47.65

11.0 Heat Loss Floors

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)
Ground Floor	Ground Floor - Solid	Other	0.12	90.00	79.04

11.2 Internal Floors

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor	Plasterboard ceiling, carpeted chipboard floor	18.00	47.65

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Front Door	Manufacture r	Solid Door							1.10
Windows & Fully Glazed Do	Manufacture r	Window	Double Low-E Soft 0.1			0.63		0.70	1.20
Roof Windows	Manufacture r	Roof Window	Double Low-E Soft 0.1			0.63		0.70	1.40

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
Front Door	Solid Door	[1] Brick and Block	West							2.15	
Front Elevation	Window	[1] Brick and Block	West	None	0.00					5.03	
Side Elevation	Window	[1] Brick and Block	North	None	0.00					0.96	
Rear Elevation	Window	[1] Brick and Block	East	None	0.00					11.76	
Velux	Roof Window	[2] Skeillins	South	None						1.10	

14.0 Conservatory

None

15.0 Draught Proofing

100 %

16.0 Draught Lobby

No

17.0 Thermal Bridging

Calculate Bridges

17.1 List of Bridges

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Source Type	Bridge Type	Length	Psi	Imported	Reference:
Independently assessed	E2 Other lintels (including other steel lintels)	1.26	0.077	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	1.82	0.070	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	2.50	0.064	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	1.70	0.064	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	4.97	0.061	No	Birtley Supatherm
Independently assessed	E3 Sill	6.25	0.021	No	Knauf P5
Independently assessed	E4 Jamb	26.40	0.016	No	Knauf P6
Table K1 - Default	E5 Ground floor (normal)	36.92	0.320	No	
Independently assessed	E6 Intermediate floor within a dwelling	30.38	0.000	No	CD0029
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	6.35	0.060	No	
Independently assessed	E24 Eaves (insulation at ceiling level - inverted)	3.10	0.151	No	Knauf P19
Independently assessed	E12 Gable (insulation at ceiling level)	6.21	0.044	No	Knauf P21
Independently assessed	E16 Corner (normal)	11.92	0.039	No	Knauf P23
Table K1 - Approved	E16 Corner (normal)	8.35	0.090	No	
Independently assessed	E17 Corner (inverted – internal area greater than external area)	2.39	-0.091	No	Knauf P24
Table K1 - Approved	E17 Corner (inverted – internal area greater than external area)	2.29	-0.090	No	
Table K1 - Default	R1 Head of roof window	0.93	0.080	No	
Table K1 - Default	R2 Sill of roof window	0.93	0.060	No	
Table K1 - Default	R3 Jamb of roof window	2.36	0.080	No	
Table K1 - Default	R6 Flat ceiling	19.40	0.060	No	
Table K1 - Default	R8 Roof to wall (rafter)	20.47	0.060	No	

Y-value W/m²K

18.0 Pressure Testing

Yes
 Designed AP₅₀ m³/(h.m²) @ 50 Pa
 Property Tested ?
 As Built AP₅₀ m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather
 Cross ventilation possible
 Night Ventilation
 Air change rate

Mechanical Ventilation

Mechanical Ventilation System Present

20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				3
Number of passive vents				0
Number of flueless gas fires				0

21.0 Fixed Cooling System

22.0 Lighting

Internal

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

External

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

External lights fitted	Yes			
Light and motion sensor	Yes			
23.0 Electricity Tariff	Standard			
24.0 Main Heating 1	Database			
Description	Gas System			
Percentage of Heat	100	%		
Database Ref. No.	17515			
Fuel Type	Mains gas			
Main Heating	BGW			
SAP Code	104			
In Winter	90.7			
In Summer	87.9			
Controls	CBE Programmer, room thermostat and TRVs			
PCDF Controls	0			
Delayed Start Stat	No			
Sap Code	2106			
Flue Type	Balanced			
Fan Assisted Flue	Yes			
Is MHS Pumped	Pump in heated space			
Heat Emitter	Radiators			
Flow Temperature	Normal (> 45°C)			
Combi boiler type	Standard Combi			
Combi keep hot type	Gas/Oil, time clock			
25.0 Main Heating 2	None			
Community Heating	None			
28.0 Water Heating	HWP From main heating 1			
Water Heating	Main Heating 1			
Flue Gas Heat Recovery System	No			
Waste Water Heat Recovery Instantaneous System 1	No			
Waste Water Heat Recovery Instantaneous System 2	No			
Waste Water Heat Recovery Storage System	No			
Solar Panel	No			
Water use <= 125 litres/person/day	Yes			
SAP Code	901			
29.0 Hot Water Cylinder	None			
32.0 Photovoltaic Unit	One Dwelling			
PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
1.10	South	30°	None Or Little	Yes

Recommendations

Lower cost measures

None

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Further measures to achieve even higher standards

None