



elmhurst
energy



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: Plot 117

Contact: Tobias Whiting
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Report Issue Date: 28/03/2023

EXCELLENCE
IN ENERGY
ASSESSMENT

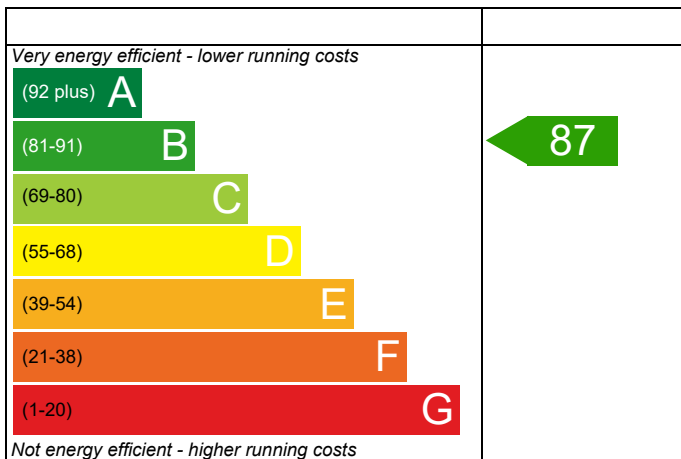
Plot 117

Dwelling type: House, Semi-Detached
 Date of assessment: 28/03/2023
 Produced by: Abacus Energy (UK) Ltd
 Total floor area: 70.86 m²
 DRRN: 0338-2507-2570

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.

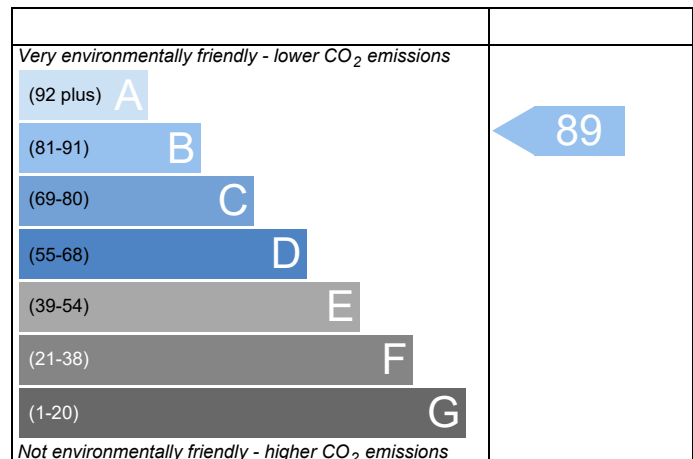
Energy Efficiency Rating



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 117	Issued on Date	28/03/2023
Assessment Reference	Rev A	Prop Type Ref	2B AFF (HA/SO)
Property	Plot 117		

SAP Rating	87 B	DER	14.89	TER	19.34
Environmental	89 B	% DER<TER	23.03		
CO ₂ Emissions (t/year)	0.78	DFEE	45.27	TFEE	52.79
General Requirements Compliance	Pass	% DFEE<TFEE	14.24		

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)	19.34	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.89	kgCO ₂ /m ²	Pass
	-4.45 (-23.0%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	52.79	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	45.27	kWh/m ² /yr	
	-7.5 (-14.2%)	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)	0.26 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	Pass
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	Pass
Openings	1.18 (max. 2.00)	1.20 (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 32CDi 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 East

3.53 m², No overhang

Windows facing West

5.09 m², No overhang

Air change rate

4.00 ach

Blinds/curtains

None

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

5.00 (design value) m³/(h.m²) @ 50 Pa

Maximum

10.0 m³/(h.m²) @ 50 Pa

Pass

10 Key features

Party wall U-value

0.00

W/m²K

Roof U-value

0.10

W/m²K

Floor U-value

0.12

W/m²K

Door U-value

1.10

W/m²K

Thermal bridging γ -value

0.039

W/m²K

Photovoltaic array

0.75

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	£4,000 - £6,000	£77	B 88	B 91	Recommended
Photovoltaic			0	0	Already installed
Wind turbine			0	0	Not applicable
Totals	£4,000 - £6,000	£77	B 88	B 91	

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THERMAL BRIDGING

Calculation Type: New Build (As Designed)

Property Reference	SAP 0879 Plot 117	Issued on Date	28/03/2023
Assessment Reference	Rev A	Prop Type Ref	2B AFF (HA/SO)
Property	Plot 117		

SAP Rating	87 B	DER	14.89	TER	19.34
Environmental	89 B	% DER<TER	23.03		
CO ₂ Emissions (t/year)	0.78	DFEE	45.27	TFEE	52.79
General Requirements Compliance	Pass	% DFEE<TFEE	14.24		

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	0.69	0.05	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.070	0.91	0.06	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.071	1.02	0.07	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.064	4.99	0.32	Birtley Supatherm
External wall	E3 Sill	Independently assessed	0.021	5.79	0.12	Knauf P5
External wall	E4 Jamb	Independently assessed	0.016	20.10	0.32	Knauf P6
External wall	E5 Ground floor (normal)	Table K1 - Approved	0.160	16.82	2.69	
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.000	16.82	0.00	CD0029
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	8.99	0.54	
External wall	E12 Gable (insulation at ceiling level)	Independently assessed	0.044	15.87	0.70	Knauf P21
External wall	E16 Corner (normal)	Independently assessed	0.039	10.60	0.41	Knauf P23
External wall	E18 Party wall between dwellings	Table K1 - Approved	0.060	8.80	0.53	
Party wall	P6 Party wall - Ground floor (inverted)	Table K1 - Default	0.070	7.93	0.56	
Party wall	P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	0.000	7.93	0.00	

Total: **6.38** W/mK:
 Y-Value: **0.039** W/m²K:

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	SAP 0879 Plot 117		Issued on Date	28/03/2023	
Assessment Reference	Rev A	Prop Type Ref	2B AFF (HA/SO)		
Property	Plot 117				
SAP Rating	87 B	DER	14.89	TER	19.34
Environmental	89 B	% DER<TER	23.03		
CO₂ Emissions (t/year)	0.78	DFEE	45.27	TFEE	52.79
General Requirements Compliance	Pass	% DFEE<TFEE	14.24		
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

Semi-Detached House, total floor area 71 m²

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

1a TER and DER

Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 19.34 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 14.89 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 52.8 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 45.3 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.26 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.18 (max. 2.00)	1.20 (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 32CDi 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 East: 3.53 m², No overhang
Windows facing West: 5.09 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.10 W/m²K
Floor U-value 0.12 W/m²K
Door U-value 1.10 W/m²K
Thermal bridging y-value 0.039 W/m²K
Photovoltaic array 0.75 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 (m2)	Storey height (m)	Volume (m3)
Ground floor	35.4300 (1b)	2.3900 (2b)	84.6777 (1b) - (3b)
First floor	35.4300 (1c)	2.6100 (2c)	92.4723 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.8600		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 177.1500 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour							
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)							
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)							
Number of intermittent fans				3 * 10 =	30.0000 (7a)							
Number of passive vents				0 * 10 =	0.0000 (7b)							
Number of flueless gas fires				0 * 40 =	0.0000 (7c)							
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)				30.0000 / (5) =	0.1693 (8)							
Pressure test					Yes							
Measured/design AP50					5.0000							
Infiltration rate					0.4193 (18)							
Number of sides sheltered					2 (19)							
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)							
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3564 (21)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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	0.4545	0.4456	0.4366	0.3921	0.3832	0.3386	0.3386	0.3297	0.3564	0.3832	0.4010	0.4188 (22b)
Effective ac	0.6033	0.5993	0.5953	0.5769	0.5734	0.5573	0.5573	0.5544	0.5635	0.5734	0.5804	0.5877 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Front Door			2.1500	1.1000	2.3650		(26)
Windows & Fully Glazed Do (Uw = 1.20)			8.6200	1.1450	9.8702		(27)
Ground Floor			35.4300	0.1200	4.2516	90.0000	3188.7000 (28a)
Brick and Block	88.3100	10.7700	77.5400	0.2400	18.6096	42.2200	3273.7388 (29a)
Step Party Wall	2.6200		2.6200	0.2600	0.6812	110.0000	288.2000 (29a)
External Roof 1	35.4300		35.4300	0.1000	3.5430	9.1000	322.4130 (30)
Total net area of external elements Aum(A, m2)			161.7900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.3206		(33)
Party Wall 1			34.8900	0.0000	0.0000	45.0000	1570.0500 (32)
GF Timber Stud			52.5200			9.0000	472.6800 (32c)
FF Timber Stud			73.8700			9.0000	664.8300 (32c)
Internal Floor 1			35.4300			18.0000	637.7400 (32d)
Internal Ceiling 1			35.4300			18.0000	637.7400 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 11056.0918 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							156.0273 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.3772 (36)
Total fabric heat loss							(33) + (36) = 45.6978 (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	35.2669	35.0325	34.8027	33.7234	33.5214	32.5814	32.5814	32.4073	32.9435	33.5214	33.9300	34.3570 (38)
Average = Sum(39)m / 12 =	80.9647	80.7303	80.5005	79.4212	79.2193	78.2792	78.2792	78.1051	78.6413	79.2193	79.6278	80.0548 (39)
HLP	1.1426	1.1393	1.1360	1.1208	1.1180	1.1047	1.1047	1.1022	1.1098	1.1180	1.1237	1.1298 (40)
HLP (average)												1.1208 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.2668 (42)
Average daily hot water use (litres/day)												88.0370 (43)
Daily hot water use	96.8407	93.3192	89.7977	86.2763	82.7548	79.2333	79.2333	82.7548	86.2763	89.7977	93.3192	96.8407 (44)
Energy conte	143.6120	125.6039	129.6120	112.9989	108.4251	93.5626	86.6995	99.4890	100.6772	117.3296	128.0744	139.0805 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy content (annual)													Total = Sum(45)m =	1385.1649 (45)
Distribution loss (46)m = 0.15 x (45)m														
	21.5418	18.8406	19.4418	16.9498	16.2638	14.0344	13.0049	14.9233	15.1016	17.5994	19.2112	20.8621	20.8621	(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	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	0.0000	(57)
Combi loss	25.2893	22.8192	25.2280	24.3733	25.1560	24.3103	25.0992	25.1361	24.3446	25.1982	24.4328	25.2774	25.2774	(61)
Total heat required for water heating calculated for each month	168.9012	148.4232	154.8400	137.3722	133.5812	117.8729	111.7988	124.6251	125.0218	142.5278	152.5072	164.3579	164.3579	(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	0.0000	(63)
Solar input (sum of months) = Sum(63)m =													0.0000 (63)	
Output from w/h	168.9012	148.4232	154.8400	137.3722	133.5812	117.8729	111.7988	124.6251	125.0218	142.5278	152.5072	164.3579	164.3579	(64)
Total per year (kWh/year) = Sum(64)m =													1681.8295 (64)	
Heat gains from water heating, kWh/month	54.0733	47.4681	49.4030	43.6655	42.3404	37.1871	35.1024	39.3641	39.5613	45.3116	48.6929	52.5636	52.5636	(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	113.3411	113.3411	113.3411	113.3411	113.3411	113.3411	113.3411	113.3411	113.3411	113.3411	113.3411	113.3411	113.3411	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.6616	17.4633	14.2021	10.7519	8.0372	6.7853	7.3318	9.5301	12.7913	16.2415	18.9562	20.2081	20.2081	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	199.2959	201.3639	196.1525	185.0579	171.0530	157.8903	149.0968	147.0288	152.2402	163.3348	177.3397	190.5024	190.5024	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.3341	34.3341	34.3341	34.3341	34.3341	34.3341	34.3341	34.3341	34.3341	34.3341	34.3341	34.3341	34.3341	(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	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	(71)
Water heating gains (Table 5)	72.6792	70.6371	66.4019	60.6465	56.9091	51.6488	47.1807	52.9087	54.9463	60.9028	67.6291	70.6500	70.6500	(72)
Total internal gains	351.6390	349.4666	336.7588	316.4586	296.0015	276.3268	263.6116	269.4700	279.9802	300.4814	323.9274	341.3629	341.3629	(73)

6. Solar gains

[Jan]		Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d	Gains W					
East		3.5300	19.6403	0.6300	0.7000	0.7700	0.7700	21.1882	(76)					
West		5.0900	19.6403	0.6300	0.7000	0.7700	0.7700	30.5518	(80)					
Solar gains	51.7400	101.2144	166.6857	243.1012	297.9296	304.9840	290.3572	249.4125	193.8624	120.0994	64.5137	42.5485	42.5485	(83)
Total gains	403.3790	450.6810	503.4445	559.5598	593.9312	581.3107	553.9688	518.8825	473.8425	420.5808	388.4411	383.9113	383.9113	(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	37.9318	38.0419	38.1505	38.6690	38.7676	39.2331	39.2331	39.3205	39.0525	38.7676	38.5687	38.3629	38.3629	(86)
alpha	3.5288	3.5361	3.5434	3.5779	3.5845	3.6155	3.6155	3.6214	3.6035	3.5845	3.5712	3.5575	3.5575	(87)
util living area	0.9901	0.9844	0.9705	0.9341	0.8573	0.7217	0.5743	0.6236	0.8324	0.9539	0.9844	0.9917	0.9917	(88)
MIT	19.2000	19.3812	19.7155	20.1672	20.5673	20.8446	20.9498	20.9318	20.7176	20.1963	19.6246	19.1722	19.1722	(89)
Th 2	19.9662	19.9689	19.9715	19.9839	19.9862	19.9970	19.9970	19.9990	19.9928	19.9862	19.9815	19.9766	19.9766	(90)
util rest of house	0.9880	0.9810	0.9636	0.9176	0.8192	0.6455	0.4618	0.5131	0.7740	0.9392	0.9804	0.9899	0.9899	(91)
MIT 2	18.3227	18.5045	18.8372	19.2869	19.6632	19.9069	19.9778	19.9706	19.8086	19.3234	18.7571	18.3028	18.3028	(92)
Living area fraction													fLA = Living area / (4) = 0.2307 (91)	
MIT	18.5251	18.7068	19.0398	19.4900	19.8718	20.1232	20.2021	20.1924	20.0184	19.5248	18.9572	18.5034	18.5034	(92)
Temperature adjustment													0.0000 (92)	
adjusted MIT	18.5251	18.7068	19.0398	19.4900	19.8718	20.1232	20.2021	20.1924	20.0184	19.5248	18.9572	18.5034	18.5034	(93)

8. Space heating requirement

Utilisation	0.9838	0.9754	0.9555	0.9079	0.8142	0.6560	0.4862	0.5361	0.7757	0.9306	0.9749	0.9863	0.9863	(94)
Useful gains	396.8569	439.5776	481.0444	508.0005	483.5972	381.3623	269.3605	278.1615	367.5628	391.4082	378.6871	378.6453	378.6453	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	4.2000	(96)
Heat loss rate W	1151.7314	1114.6250	1009.4629	841.0696	647.3623	432.3550	281.9661	296.2048	465.4273	707.0164	944.1640	1145.0564	1145.0564	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	561.6266	453.6319	393.1434	239.8098	121.8412	0.0000	0.0000	0.0000	0.0000	234.8125	407.1434	570.2098	570.2098	(98)
Space heating													2982.2185 (98)	
Space heating per m ²													(98) / (4) = 42.0861 (99)	

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3288.0028 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	561.6266	453.6319	393.1434	239.8098	121.8412	0.0000	0.0000	0.0000	0.0000	234.8125	407.1434	570.2098	(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)	619.2135	500.1454	433.4547	264.3989	134.3343	0.0000	0.0000	0.0000	0.0000	258.8892	448.8902	628.6767	(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	168.9012	148.4232	154.8400	137.3722	133.5812	117.8729	111.7988	124.6251	125.0218	142.5278	152.5072	164.3579	(64)
Efficiency of water heater (217)m	89.8660	89.8113	89.6829	89.3932	88.8352	87.2000	87.2000	87.2000	87.2000	89.3455	89.7187	87.2000	(216)
Fuel for water heating, kWh/month	187.9478	165.2611	172.6529	153.6719	150.3696	135.1754	128.2096	142.9187	143.3737	159.5244	169.9838	182.8379	(219)
Water heating fuel used													1891.9266 (219)
Annual totals kWh/year													
Space heating fuel - main system													3288.0028 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													75.0000 (231)
Electricity for lighting (calculated in Appendix L)													347.2306 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.75 * 908 * 1.00) =										-544.7125			-544.7125 (233)
Total delivered energy for all uses													5057.4475 (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	3288.0028	0.2160	710.2086 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1891.9266	0.2160	408.6562 (264)
Space and water heating			1118.8648 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	347.2306	0.5190	180.2127 (268)
Energy saving/generation technologies			
PV Unit	-544.7125	0.5190	-282.7058 (269)
Total CO2, kg/year			1055.2966 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			14.8900 (273)

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

DER			14.8900 ZC1
Total Floor Area		TFA	70.8600
Assumed number of occupants		N	2.2668
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			16.6665 ZC2
CO2 emissions from cooking, equation (L16)			2.4471 ZC3
Total CO2 emissions			34.0036 ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000 ZC5
Additional allowable electricity generation, kWh/m ² /year			0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000 ZC7
Net CO2 emissions			34.0036 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	35.4300 (1b)	2.3900 (2b)	84.6777 (1b) - (3b)
First floor	35.4300 (1c)	2.6100 (2c)	92.4723 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.8600		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 177.1500 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				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) =	0.1693 (8)
Pressure test				Yes	
Measured/design AP50				5.0000	
Infiltration rate					0.4193 (18)
Number of sides sheltered				2	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3564 (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	0.4545	0.4456	0.4366	0.3921	0.3832	0.3386	0.3386	0.3297	0.3564	0.3832	0.4010	0.4188 (22b)
Effective ac	0.6033	0.5993	0.5953	0.5769	0.5734	0.5573	0.5573	0.5544	0.5635	0.5734	0.5804	0.5877 (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)			8.6200	1.3258	11.4280		(27)
Ground Floor			35.4300	0.1300	4.6059		(28a)
Brick and Block	88.3100	10.7700	77.5400	0.1800	13.9572		(29a)
Step Party Wall	2.6200		2.6200	0.1800	0.4716		(29a)
External Roof 1	35.4300		35.4300	0.1300	4.6059		(30)
Total net area of external elements Aum(A, m ²)			161.7900				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =		37.2186 (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)							7.8949 (36)
Total fabric heat loss						(33) + (36) =	45.1135 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	35.2669	35.0325	34.8027	33.7234	33.5214	32.5814	32.5814	32.4073	32.9435	33.5214	33.9300	34.3570 (38)
Heat transfer coeff	80.3804	80.1460	79.9162	78.8369	78.6350	77.6949	77.6949	77.5209	78.0570	78.6350	79.0435	79.4706 (39)
Average = Sum(39)m / 12 =												78.8359 (39)
HLP	1.1344	1.1310	1.1278	1.1126	1.1097	1.0965	1.0965	1.0940	1.1016	1.1097	1.1155	1.1215 (40)
HLP (average)												1.1126 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.2668 (42)
Average daily hot water use (litres/day)												88.0370 (43)
Daily hot water use	96.8407	93.3192	89.7977	86.2763	82.7548	79.2333	79.2333	82.7548	86.2763	89.7977	93.3192	96.8407 (44)
Energy conte	143.6120	125.6039	129.6120	112.9989	108.4251	93.5626	86.6995	99.4890	100.6772	117.3296	128.0744	139.0805 (45)
Energy content (annual)												Total = Sum(45)m = 1385.1649 (45)
Distribution loss (46)m = 0.15 x (45)m	21.5418	18.8406	19.4418	16.9498	16.2638	14.0344	13.0049	14.9233	15.1016	17.5994	19.2112	20.8621 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	49.3490	42.9524	45.7599	42.5472	42.1709	39.0740	40.3764	42.1709	42.5472	45.7599	46.0204	49.3490	49.3490	49.3490	(61)
Total heat required for water heating calculated for each month	192.9609	168.5564	175.3720	155.5461	150.5961	132.6366	127.0760	141.6599	143.2244	163.0895	174.0949	188.4295	188.4295	188.4295	(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	0.0000	0.0000	(63)
Output from w/h	192.9609	168.5564	175.3720	155.5461	150.5961	132.6366	127.0760	141.6599	143.2244	163.0895	174.0949	188.4295	188.4295	188.4295	(64)
Heat gains from water heating, kWh/month	60.0882	52.5014	54.5360	48.2089	46.5941	40.8781	38.9217	43.6228	44.1120	50.4521	54.0899	58.5815	58.5815	58.5815	(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	113.3411	113.3411	113.3411	113.3411	113.3411	113.3411	113.3411	113.3411	113.3411	113.3411	113.3411	113.3411	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.6616	17.4633	14.2021	10.7519	8.0372	6.7853	7.3318	9.5301	12.7913	16.2415	18.9562	20.2081	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	199.2959	201.3639	196.1525	185.0579	171.0530	157.8903	149.0968	147.0288	152.2402	163.3348	177.3397	190.5024	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.3341	34.3341	34.3341	34.3341	34.3341	34.3341	34.3341	34.3341	34.3341	34.3341	34.3341	34.3341	(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)	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	(71)
Water heating gains (Table 5)	80.7637	78.1271	73.3011	66.9569	62.6265	56.7751	52.3141	58.6328	61.2666	67.8119	75.1248	78.7386	(72)
Total internal gains	359.7236	356.9566	343.6579	322.7690	301.7189	281.4530	268.7451	275.1940	286.3005	307.3906	331.4231	349.4514	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W							
East	3.5300	19.6403	0.6300	0.7000	0.7700	21.1882 (76)							
West	5.0900	19.6403	0.6300	0.7000	0.7700	30.5518 (80)							
Solar gains	51.7400	101.2144	166.6857	243.1012	297.9296	304.9840	290.3572	249.4125	193.8624	120.0994	64.5137	42.5485	(83)
Total gains	411.4636	458.1711	510.3437	565.8701	599.6485	586.4370	559.1022	524.6066	480.1629	427.4900	395.9368	391.9999	(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	61.2193	61.3984	61.5749	62.4179	62.5782	63.3353	63.3353	63.4775	63.0415	62.5782	62.2548	61.9202	
alpha	5.0813	5.0932	5.1050	5.1612	5.1719	5.2224	5.2224	5.2318	5.2028	5.1719	5.1503	5.1280	
util living area	0.9983	0.9967	0.9914	0.9714	0.9087	0.7630	0.5923	0.6480	0.8828	0.9830	0.9967	0.9987	(86)
MIT	19.7618	19.8912	20.1313	20.4605	20.7511	20.9334	20.9857	20.9777	20.8466	20.4692	20.0609	19.7428	(87)
Th 2	19.9729	19.9756	19.9782	19.9906	19.9929	20.0037	20.0037	20.0057	19.9996	19.9929	19.9882	19.9833	(88)
util rest of house	0.9977	0.9955	0.9883	0.9599	0.8710	0.6753	0.4680	0.5234	0.8207	0.9742	0.9953	0.9982	(89)
MIT 2	18.3196	18.5105	18.8618	19.3433	19.7390	19.9571	19.9982	19.9960	19.8695	19.3629	18.7679	18.2993	(90)
Living area fraction									fLA = Living area / (4) =			0.2307	(91)
MIT	18.6523	18.8291	19.1547	19.6011	19.9725	20.1823	20.2261	20.2225	20.0950	19.6182	19.0663	18.6324	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6523	18.8291	19.1547	19.6011	19.9725	20.1823	20.2261	20.2225	20.0950	19.6182	19.0663	18.6324	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9966	0.9937	0.9847	0.9542	0.8701	0.6925	0.4968	0.5521	0.8278	0.9697	0.9934	0.9973	(94)
Useful gains	410.0559	455.2634	502.5236	539.9375	521.7359	406.1252	277.7720	289.6416	397.4709	414.5295	393.3288	390.9496	(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	1153.6463	1116.3594	1011.3172	843.6413	650.5104	433.7195	281.7261	296.3269	467.9486	709.1447	945.8563	1146.9492	(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	553.2312	444.2565	378.5424	218.6668	95.8082	0.0000	0.0000	0.0000	0.0000	219.1937	397.8198	562.4637	(98)
Space heating												2869.9824	(98)
Space heating per m2										(98) / (4) =		40.5022	(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													3072.7863 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	553.2312	444.2565	378.5424	218.6668	95.8082	0.0000	0.0000	0.0000	0.0000	219.1937	397.8198	562.4637	(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)	592.3247	475.6494	405.2917	234.1186	102.5784	0.0000	0.0000	0.0000	0.0000	234.6828	425.9313	602.2095	(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	192.9609	168.5564	175.3720	155.5461	150.5961	132.6366	127.0760	141.6599	143.2244	163.0895	174.0949	188.4295	(64)
Efficiency of water heater (217)m	87.5523	87.3771	86.9380	85.9086	83.9468	80.3000	80.3000	80.3000	80.3000	85.7962	87.0664	80.3000	(216)
Fuel for water heating, kWh/month	220.3950	192.9067	201.7208	181.0600	179.3947	165.1763	158.2515	176.4134	178.3617	190.0894	199.9564	215.0187	(219)
Water heating fuel used													2258.7446 (219)
Annual totals kWh/year													
Space heating fuel - main system													3072.7863 (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)													347.2306 (232)
Total delivered energy for all uses													5753.7615 (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	3072.7863	0.2160	663.7218 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2258.7446	0.2160	487.8888 (264)
Space and water heating			1151.6107 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	347.2306	0.5190	180.2127 (268)
Total CO2, kg/m2/year			1370.7484 (272)
Emissions per m2 for space and water heating			16.2519 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.5432 (272b)
Emissions per m2 for pumps and fans			0.5493 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.2519 * 1.00) + 2.5432 + 0.5493, rounded to 2 d.p.			19.3400 (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 (m2)	Storey height (m)	Volume (m3)
Ground floor	35.4300 (1b)	x 2.3900 (2b)	= 84.6777 (1b) - (3b)
First floor	35.4300 (1c)	x 2.6100 (2c)	= 92.4723 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.8600		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 177.1500 (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) = 0.1693 (8)							
Pressure test					Yes							
Measured/design AP50					5.0000							
Infiltration rate					0.4193 (18)							
Number of sides sheltered					2 (19)							
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)							
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3564 (21)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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	0.4545	0.4456	0.4366	0.3921	0.3832	0.3386	0.3386	0.3297	0.3564	0.3832	0.4010	0.4188 (22b)
Effective ac	0.6033	0.5993	0.5953	0.5769	0.5734	0.5573	0.5573	0.5544	0.5635	0.5734	0.5804	0.5877 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Front Door			2.1500	1.1000	2.3650		(26)
Windows & Fully Glazed Do (Uw = 1.20)			8.6200	1.1450	9.8702		(27)
Ground Floor			35.4300	0.1200	4.2516	90.0000	3188.7000 (28a)
Brick and Block	88.3100	10.7700	77.5400	0.2400	18.6096	42.2200	3273.7388 (29a)
Step Party Wall	2.6200		2.6200	0.2600	0.6812	110.0000	288.2000 (29a)
External Roof 1	35.4300		35.4300	0.1000	3.5430	9.1000	322.4130 (30)
Total net area of external elements Aum(A, m2)			161.7900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.3206		(33)
Party Wall 1			34.8900	0.0000	0.0000	45.0000	1570.0500 (32)
GF Timber Stud			52.5200			9.0000	472.6800 (32c)
FF Timber Stud			73.8700			9.0000	664.8300 (32c)
Internal Floor 1			35.4300			18.0000	637.7400 (32d)
Internal Ceiling 1			35.4300			9.0000	318.8700 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 10737.2218 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							151.5273 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.3772 (36)
Total fabric heat loss							(33) + (36) = 45.6978 (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	35.2669	35.0325	34.8027	33.7234	33.5214	32.5814	32.5814	32.4073	32.9435	33.5214	33.9300	34.3570 (38)
Average = Sum(39)m / 12 =	80.9647	80.7303	80.5005	79.4212	79.2193	78.2792	78.2792	78.1051	78.6413	79.2193	79.6278	80.0548 (39)
HLP	1.1426	1.1393	1.1360	1.1208	1.1180	1.1047	1.1047	1.1022	1.1098	1.1180	1.1237	1.1298 (40)
HLP (average)												1.1208 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.2668 (42)
Average daily hot water use (litres/day)												88.0370 (43)
Daily hot water use	96.8407	93.3192	89.7977	86.2763	82.7548	79.2333	79.2333	82.7548	86.2763	89.7977	93.3192	96.8407 (44)
Energy conte	143.6120	125.6039	129.6120	112.9989	108.4251	93.5626	86.6995	99.4890	100.6772	117.3296	128.0744	139.0805 (45)

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Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	572.6133	490.9409	486.1993	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	732.9134	701.2077	659.4124	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												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	115.4161	156.4385	128.8706	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction												400.7251 (104)
Intermittency factor (Table 10b)												FC = cooled area / (4) =
Intermittency factor	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	1.0000 (105)
Space cooling kWh												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	28.8540	39.1096	32.2176	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling												100.1813 (107)
Space cooling per m2												1.4138 (108)
Energy for space heating												43.8555 (99)
Energy for space cooling												1.4138 (108)
Total												45.2693 (109)
Dwelling Fabric Energy Efficiency (DFEE)												45.3 (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	35.4300 (1b)	2.3900 (2b)	84.6777 (1b) - (3b)
First floor	35.4300 (1c)	2.6100 (2c)	92.4723 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.8600		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 177.1500 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour							
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)							
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)							
Number of intermittent fans				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) =	0.1693 (8)							
Pressure test				Yes								
Measured/design AP50				5.0000								
Infiltration rate					0.4193 (18)							
Number of sides sheltered				2	(19)							
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)							
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3564 (21)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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	0.4545	0.4456	0.4366	0.3921	0.3832	0.3386	0.3386	0.3297	0.3564	0.3832	0.4010	0.4188 (22b)
Effective ac	0.6033	0.5993	0.5953	0.5769	0.5734	0.5573	0.5573	0.5544	0.5635	0.5734	0.5804	0.5877 (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)			8.6200	1.3258	11.4280		(27)					
Ground Floor			35.4300	0.1300	4.6059		(28a)					
Brick and Block	88.3100	10.7700	77.5400	0.1800	13.9572		(29a)					
Step Party Wall	2.6200		2.6200	0.1800	0.4716		(29a)					
External Roof 1	35.4300		35.4300	0.1300	4.6059		(30)					
Total net area of external elements Aum(A, m ²)			161.7900				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 37.2186		(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)							7.8949 (36)					
Total fabric heat loss							(33) + (36) = 45.1135 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 35.2669	Feb 35.0325	Mar 34.8027	Apr 33.7234	May 33.5214	Jun 32.5814	Jul 32.5814	Aug 32.4073	Sep 32.9435	Oct 33.5214	Nov 33.9300	Dec 34.3570 (38)
Heat transfer coeff	80.3804	80.1460	79.9162	78.8369	78.6350	77.6949	77.6949	77.5209	78.0570	78.6350	79.0435	79.4706 (39)
Average = Sum(39)m / 12 =												78.8359 (39)
HLP	Jan 1.1344	Feb 1.1310	Mar 1.1278	Apr 1.1126	May 1.1097	Jun 1.0965	Jul 1.0965	Aug 1.0940	Sep 1.1016	Oct 1.1097	Nov 1.1155	Dec 1.1215 (40)
HLP (average)												1.1126 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.2668 (42)
Average daily hot water use (litres/day)												88.0370 (43)
Daily hot water use	96.8407	93.3192	89.7977	86.2763	82.7548	79.2333	79.2333	82.7548	86.2763	89.7977	93.3192	96.8407 (44)
Energy conte	143.6120	125.6039	129.6120	112.9989	108.4251	93.5626	86.6995	99.4890	100.6772	117.3296	128.0744	139.0805 (45)
Energy content (annual)												Total = Sum(45)m = 1385.1649 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)

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If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
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	0.0000	(59)
Heat gains from water heating, kWh/month	30.5175	26.6908	27.5426	24.0123	23.0403	19.8821	18.4237	21.1414	21.3939	24.9325	27.2158	29.5546	(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	113.3411	113.3411	113.3411	113.3411	113.3411	113.3411	113.3411	113.3411	113.3411	113.3411	113.3411	113.3411	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.6616	17.4633	14.2021	10.7519	8.0372	6.7853	7.3318	9.5301	12.7913	16.2415	18.9562	20.2081	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	199.2959	201.3639	196.1525	185.0579	171.0530	157.8903	149.0968	147.0288	152.2402	163.3348	177.3397	190.5024	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.3341	34.3341	34.3341	34.3341	34.3341	34.3341	34.3341	34.3341	34.3341	34.3341	34.3341	34.3341	(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)	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	(71)
Water heating gains (Table 5)	41.0182	39.7185	37.0196	33.3504	30.9682	27.6140	24.7630	28.4159	29.7138	33.5115	37.7997	39.7239	(72)
Total internal gains	316.9780	315.5481	304.3765	286.1625	267.0607	249.2919	238.1939	241.9771	251.7476	270.0901	291.0980	307.4368	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W							
East	3.5300	19.6403	0.6300	0.7000	0.7700	21.1882 (76)							
West	5.0900	19.6403	0.6300	0.7000	0.7700	30.5518 (80)							
Solar gains	51.7400	101.2144	166.6857	243.1012	297.9296	304.9840	290.3572	249.4125	193.8624	120.0994	64.5137	42.5485	(83)
Total gains	368.7180	416.7625	471.0622	529.2637	564.9903	554.2759	528.5511	491.3896	445.6100	390.1896	355.6117	349.9852	(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	61.2193	61.3984	61.5749	62.4179	62.5782	63.3353	63.3353	63.4775	63.0415	62.5782	62.2548	61.9202	
alpha	5.0813	5.0932	5.1050	5.1612	5.1719	5.2224	5.2224	5.2318	5.2028	5.1719	5.1503	5.1280	
util living area	0.9990	0.9979	0.9940	0.9781	0.9248	0.7905	0.6216	0.6827	0.9068	0.9885	0.9980	0.9992 (86)	
MIT	19.7054	19.8370	20.0810	20.4179	20.7212	20.9209	20.9822	20.9717	20.8202	20.4231	20.0079	19.6872 (87)	
Th 2	19.9729	19.9756	19.9782	19.9906	19.9929	20.0037	20.0037	20.0057	19.9996	19.9929	19.9882	19.9833 (88)	
util rest of house	0.9986	0.9971	0.9917	0.9690	0.8917	0.7051	0.4935	0.5556	0.8522	0.9823	0.9971	0.9990 (89)	
MIT 2	18.7878	18.9213	19.1665	19.5082	19.7948	19.9649	19.9989	19.9970	19.8916	19.5185	19.1024	18.7780 (90)	
Living area fraction									fLA = Living area / (4) =				
MIT	18.9995	19.1326	19.3775	19.7181	20.0086	20.1855	20.2258	20.2219	20.1059	19.7272	19.3113	18.9878 (92)	
Temperature adjustment												0.0000	
adjusted MIT	18.9995	19.1326	19.3775	19.7181	20.0086	20.1855	20.2258	20.2219	20.1059	19.7272	19.3113	18.9878 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(94)
Useful gains	368.0346	415.1914	466.2933	511.1936	504.1249	400.3962	276.6864	287.5706	382.9035	382.3929	354.2969	349.4919	(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	1181.5550	1140.6847	1029.1202	852.8642	653.3464	433.9632	281.7058	296.2794	468.7989	717.7161	965.2268	1175.1934	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	605.2592	487.5315	418.7432	246.0028	111.0208	0.0000	0.0000	0.0000	0.0000	249.4804	439.8696	614.3220	(98)
Space heating												3172.2294	(98)
Space heating per m2										(98) / (4) =		44.7676	(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	730.3324	574.9425	589.1585	0.0000	0.0000	0.0000	0.0000 (100)	
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8408	0.9100	0.8828	0.0000	0.0000	0.0000	0.0000 (101)	
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	614.0385	523.1856	520.1377	0.0000	0.0000	0.0000	0.0000 (102)	
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	732.9134	701.2077	659.4124	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	85.5899	132.4485	103.6204	0.0000	0.0000	0.0000	0.0000 (104)	
Space cooling												321.6587	(104)

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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	21.3975	33.1121	25.9051	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling											80.4147 (107)	
Space cooling per m2											1.1348 (108)	
Energy for space heating											44.7676 (99)	
Energy for space cooling											1.1348 (108)	
Total											45.9024 (109)	
Target Fabric Energy Efficiency (TFEE)											52.8 (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 (m2)	Storey height (m)	Volume (m3)
Ground floor	35.4300 (1b)	2.3900 (2b)	84.6777 (1b) - (3b)
First floor	35.4300 (1c)	2.6100 (2c)	92.4723 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.8600		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 177.1500 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour							
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)							
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)							
Number of intermittent fans				3 * 10 =	30.0000 (7a)							
Number of passive vents				0 * 10 =	0.0000 (7b)							
Number of flueless gas fires				0 * 40 =	0.0000 (7c)							
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)				30.0000 / (5) =	0.1693 (8)							
Pressure test					Yes							
Measured/design AP50					5.0000							
Infiltration rate					0.4193 (18)							
Number of sides sheltered					2 (19)							
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)							
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3564 (21)							
Wind speed	Jan 5.1000	Feb 4.7000	Mar 4.6000	Apr 4.3000	May 4.3000	Jun 4.0000	Jul 4.0000	Aug 3.9000	Sep 4.0000	Oct 4.5000	Nov 4.4000	Dec 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	0.4545	0.4188	0.4099	0.3832	0.3832	0.3564	0.3564	0.3475	0.3564	0.4010	0.3921	0.4188 (22b)
Effective ac	0.6033	0.5877	0.5840	0.5734	0.5734	0.5635	0.5635	0.5604	0.5635	0.5804	0.5769	0.5877 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Front Door			2.1500	1.1000	2.3650		(26)
Windows & Fully Glazed Do (Uw = 1.20)			8.6200	1.1450	9.8702		(27)
Ground Floor			35.4300	0.1200	4.2516	90.0000	3188.7000 (28a)
Brick and Block	88.3100	10.7700	77.5400	0.2400	18.6096	42.2200	3273.7388 (29a)
Step Party Wall	2.6200		2.6200	0.2600	0.6812	110.0000	288.2000 (29a)
External Roof 1	35.4300		35.4300	0.1000	3.5430	9.1000	322.4130 (30)
Total net area of external elements Aum(A, m2)			161.7900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.3206		(33)
Party Wall 1			34.8900	0.0000	0.0000	45.0000	1570.0500 (32)
GF Timber Stud			52.5200			9.0000	472.6800 (32c)
FF Timber Stud			73.8700			9.0000	664.8300 (32c)
Internal Floor 1			35.4300			18.0000	637.7400 (32d)
Internal Ceiling 1			35.4300			18.0000	637.7400 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 11056.0918 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							156.0273 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.3772 (36)
Total fabric heat loss						(33) + (36) =	45.6978 (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	35.2669	34.3570	34.1412	33.5214	33.5214	32.9435	32.9435	32.7601	32.9435	33.9300	33.7234	34.3570 (38)
Average = Sum(39)m / 12 =	80.9647	80.0548	79.8390	79.2193	79.2193	78.6413	78.6413	78.4579	78.6413	79.6278	79.4212	80.0548 (39)
HLP	1.1426	1.1298	1.1267	1.1180	1.1180	1.1098	1.1098	1.1072	1.1098	1.1237	1.1208	1.1298 (40)
HLP (average)												1.1205 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.2668 (42)
Average daily hot water use (litres/day)												88.0370 (43)
Daily hot water use	96.8407	93.3192	89.7977	86.2763	82.7548	79.2333	79.2333	82.7548	86.2763	89.7977	93.3192	96.8407 (44)
Energy conte	143.6120	125.6039	129.6120	112.9989	108.4251	93.5626	86.6995	99.4890	100.6772	117.3296	128.0744	139.0805 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Energy content (annual)													Total = Sum(45)m =	1385.1649 (45)
Distribution loss (46)m = 0.15 x (45)m	21.5418	18.8406	19.4418	16.9498	16.2638	14.0344	13.0049	14.9233	15.1016	17.5994	19.2112	20.8621	20.8621	(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	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	0.0000	(57)
Combi loss	25.2893	22.8192	25.2280	24.3733	25.1560	24.3103	25.0992	25.1361	24.3446	25.1982	24.4328	25.2774	25.2774	(61)
Total heat required for water heating calculated for each month	168.9012	148.4232	154.8400	137.3722	133.5812	117.8729	111.7988	124.6251	125.0218	142.5278	152.5072	164.3579	164.3579	(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	0.0000	(63)
Solar input (sum of months) = Sum(63)m =													0.0000 (63)	
Output from w/h	168.9012	148.4232	154.8400	137.3722	133.5812	117.8729	111.7988	124.6251	125.0218	142.5278	152.5072	164.3579	164.3579	(64)
Total per year (kWh/year) = Sum(64)m =													1681.8295 (64)	
RHI water heating demand													1682 (64)	
Heat gains from water heating, kWh/month	54.0733	47.4681	49.4030	43.6655	42.3404	37.1871	35.1024	39.3641	39.5613	45.3116	48.6929	52.5636	52.5636	(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	136.0093	136.0093	136.0093	136.0093	136.0093	136.0093	136.0093	136.0093	136.0093	136.0093	136.0093	136.0093	136.0093	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	49.1541	43.6582	35.5053	26.8798	20.9299	16.9633	18.3294	23.8253	31.9783	40.6038	47.3906	50.5202	50.5202	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	297.4565	300.5432	292.7649	276.2058	255.3029	235.6572	222.5326	219.4459	227.2242	243.7833	264.6862	284.3319	284.3319	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.8677	50.8677	50.8677	50.8677	50.8677	50.8677	50.8677	50.8677	50.8677	50.8677	50.8677	50.8677	50.8677	(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	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	(71)
Water heating gains (Table 5)	72.6792	70.6371	66.4019	60.6465	56.9091	51.6488	47.1807	52.9087	54.9463	60.9028	67.6291	70.6500	70.6500	(72)
Total internal gains	518.4939	514.0427	493.8762	462.9362	431.5091	403.4735	387.2469	395.3842	413.3530	444.4940	478.9101	504.7064	504.7064	(73)

6. Solar gains

[Jan]	Area	Solar flux	Specific data	FF	Access	Gains								
	m2	Table 6a	g		factor	W								
		W/m2	or Table 6b	or Table 6c	Table 6d									
East	3.5300	25.9136	0.6300	0.7000	0.7700	27.9560 (76)								
West	5.0900	25.9136	0.6300	0.7000	0.7700	40.3105 (80)								
Solar gains	68.2665	114.0333	186.1415	275.0155	320.8254	354.9870	330.0403	290.2837	229.0755	142.9595	84.3343	53.6049	53.6049	(83)
Total gains	586.7604	628.0759	680.0177	737.9517	752.3346	758.4605	717.2872	685.6678	642.4285	587.4536	563.2443	558.3113	558.3113	(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	37.9318	38.3629	38.4666	38.7676	38.7676	39.0525	39.0525	39.1437	39.0525	38.5687	38.6690	38.3629	38.3629	(87)
alpha	3.5288	3.5575	3.5644	3.5845	3.5845	3.6035	3.6035	3.6096	3.6035	3.5712	3.5779	3.5575	3.5575	(88)
util living area	0.9631	0.9525	0.9215	0.8532	0.7316	0.5432	0.3962	0.4122	0.6499	0.8583	0.9397	0.9670	0.9670	(86)
MIT	19.6813	19.8121	20.1137	20.4799	20.7813	20.9460	20.9870	20.9854	20.8965	20.5664	20.1043	19.6712	19.6712	(87)
Th 2	19.9662	19.9766	19.9791	19.9862	19.9862	19.9928	19.9928	19.9949	19.9928	19.9815	19.9839	19.9766	19.9766	(88)
util rest of house	0.9553	0.9427	0.9051	0.8223	0.6751	0.4584	0.2927	0.3053	0.5662	0.8197	0.9251	0.9600	0.9600	(89)
MIT 2	18.7971	18.9324	19.2262	19.5755	19.8394	19.9671	19.9893	19.9909	19.9378	19.6589	19.2258	18.7957	18.7957	(90)
Living area fraction	19.0011	19.1354	19.4310	19.7842	20.0567	20.1930	20.2195	20.2204	20.1590	19.8683	19.4285	18.9977	18.9977	(92)
Temperature adjustment	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(91)
adjusted MIT	19.0011	19.1354	19.4310	19.7842	20.0567	20.1930	20.2195	20.2204	20.1590	19.8683	19.4285	18.9977	18.9977	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains	0.9462	0.9328	0.8946	0.8153	0.6794	0.4760	0.3165	0.3299	0.5810	0.8148	0.9152	0.9515	0.9515	(94)
Ext temp.	555.2118	585.8916	608.3227	601.6669	511.1209	361.0288	227.0071	226.1901	373.2670	478.6488	515.4982	531.2174	531.2174	(95)
Heat loss rate W	5.4000	5.7000	7.3000	9.6000	12.6000	15.4000	17.3000	17.3000	15.0000	11.8000	8.4000	5.5000	5.5000	(96)
Month fracti	1101.2083	1075.5703	968.5277	806.7831	590.7136	376.9245	229.5950	229.1273	405.7091	642.4596	875.8956	1080.5584	1080.5584	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating	406.2214	329.0641	267.9925	147.6836	59.2169	0.0000	0.0000	0.0000	0.0000	121.8752	259.4861	408.7097	408.7097	(98)
RHI space heating demand													2000.2495 (98)	
													2000 (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 (m2)	Storey height (m)	Volume (m3)
Ground floor	35.4300 (1b)	x 2.3900 (2b)	= 84.6777 (1b) - (3b)
First floor	35.4300 (1c)	x 2.6100 (2c)	= 92.4723 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.8600		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 177.1500 (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) = 0.1693 (8)							
Pressure test					Yes							
Measured/design AP50					5.0000							
Infiltration rate					0.4193 (18)							
Number of sides sheltered					2 (19)							
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)							
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3564 (21)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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	0.4545	0.4456	0.4366	0.3921	0.3832	0.3386	0.3386	0.3297	0.3564	0.3832	0.4010	0.4188 (22b)
Effective ac	0.6033	0.5993	0.5953	0.5769	0.5734	0.5573	0.5573	0.5544	0.5635	0.5734	0.5804	0.5877 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Front Door			2.1500	1.1000	2.3650		(26)
Windows & Fully Glazed Do (Uw = 1.20)			8.6200	1.1450	9.8702		(27)
Ground Floor			35.4300	0.1200	4.2516	90.0000	3188.7000 (28a)
Brick and Block	88.3100	10.7700	77.5400	0.2400	18.6096	42.2200	3273.7388 (29a)
Step Party Wall	2.6200		2.6200	0.2600	0.6812	110.0000	288.2000 (29a)
External Roof 1	35.4300		35.4300	0.1000	3.5430	9.1000	322.4130 (30)
Total net area of external elements Aum(A, m2)			161.7900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.3206		(33)
Party Wall 1			34.8900	0.0000	0.0000	45.0000	1570.0500 (32)
GF Timber Stud			52.5200			9.0000	472.6800 (32c)
FF Timber Stud			73.8700			9.0000	664.8300 (32c)
Internal Floor 1			35.4300			18.0000	637.7400 (32d)
Internal Ceiling 1			35.4300			18.0000	637.7400 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 11056.0918 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							156.0273 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.3772 (36)
Total fabric heat loss							(33) + (36) = 45.6978 (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	35.2669	35.0325	34.8027	33.7234	33.5214	32.5814	32.5814	32.4073	32.9435	33.5214	33.9300	34.3570 (38)
Average = Sum(39)m / 12 =	80.9647	80.7303	80.5005	79.4212	79.2193	78.2792	78.2792	78.1051	78.6413	79.2193	79.6278	80.0548 (39)
HLP	1.1426	1.1393	1.1360	1.1208	1.1180	1.1047	1.1047	1.1022	1.1098	1.1180	1.1237	1.1298 (40)
HLP (average)												1.1208 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.2668 (42)
Average daily hot water use (litres/day)												88.0370 (43)
Daily hot water use	96.8407	93.3192	89.7977	86.2763	82.7548	79.2333	79.2333	82.7548	86.2763	89.7977	93.3192	96.8407 (44)
Energy conte	143.6120	125.6039	129.6120	112.9989	108.4251	93.5626	86.6995	99.4890	100.6772	117.3296	128.0744	139.0805 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Energy content (annual)													Total = Sum(45)m =	1385.1649 (45)
Distribution loss (46)m = 0.15 x (45)m														
	21.5418	18.8406	19.4418	16.9498	16.2638	14.0344	13.0049	14.9233	15.1016	17.5994	19.2112	20.8621	20.8621	(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	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	0.0000	(57)
Combi loss	25.2893	22.8192	25.2280	24.3733	25.1560	24.3103	25.0992	25.1361	24.3446	25.1982	24.4328	25.2774	25.2774	(61)
Total heat required for water heating calculated for each month	168.9012	148.4232	154.8400	137.3722	133.5812	117.8729	111.7988	124.6251	125.0218	142.5278	152.5072	164.3579	164.3579	(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	0.0000	(63)
Solar input (sum of months) = Sum(63)m =													0.0000 (63)	
Output from w/h	168.9012	148.4232	154.8400	137.3722	133.5812	117.8729	111.7988	124.6251	125.0218	142.5278	152.5072	164.3579	164.3579	(64)
Total per year (kWh/year) = Sum(64)m =													1681.8295 (64)	
Heat gains from water heating, kWh/month	54.0733	47.4681	49.4030	43.6655	42.3404	37.1871	35.1024	39.3641	39.5613	45.3116	48.6929	52.5636	52.5636	(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	136.0093	136.0093	136.0093	136.0093	136.0093	136.0093	136.0093	136.0093	136.0093	136.0093	136.0093	136.0093	136.0093	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	49.1541	43.6582	35.5053	26.8798	20.0929	16.9633	18.3294	23.8253	31.9783	40.6038	47.3906	50.5202	50.5202	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	297.4565	300.5432	292.7649	276.2058	255.3029	235.6572	222.5326	219.4459	227.2242	243.7833	264.6862	284.3319	284.3319	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.8677	50.8677	50.8677	50.8677	50.8677	50.8677	50.8677	50.8677	50.8677	50.8677	50.8677	50.8677	50.8677	(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	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	(71)
Water heating gains (Table 5)	72.6792	70.6371	66.4019	60.6465	56.9091	51.6488	47.1807	52.9087	54.9463	60.9028	67.6291	70.6500	70.6500	(72)
Total internal gains	518.4939	514.0427	493.8762	462.9362	431.5091	403.4735	387.2469	395.3842	413.3530	444.4940	478.9101	504.7064	504.7064	(73)

6. Solar gains

[Jan]		Area m ²	Solar flux Table 6a W/m ²	Specific data g or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W							
East		3.5300	19.6403	0.6300	0.7000	0.7700	21.1882 (76)							
West		5.0900	19.6403	0.6300	0.7000	0.7700	30.5518 (80)							
Solar gains	51.7400	101.2144	166.6857	243.1012	297.9296	304.9840	290.3572	249.4125	193.8624	120.0994	64.5137	42.5485	42.5485	(83)
Total gains	570.2339	615.2571	660.5619	706.0374	729.4388	708.4574	677.6041	644.7967	607.2154	564.5934	543.4237	547.2548	547.2548	(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	37.9318	38.0419	38.1505	38.6690	38.7676	39.2331	39.2331	39.3205	39.0525	38.7676	38.5687	38.3629	38.3629	(86)
alpha	3.5288	3.5361	3.5434	3.5779	3.5845	3.6155	3.6155	3.6214	3.6035	3.5845	3.5712	3.5575	3.5575	(87)
util living area	0.9720	0.9613	0.9376	0.8836	0.7858	0.6330	0.4857	0.5254	0.7368	0.9013	0.9583	0.9754	0.9754	(88)
MIT	19.4925	19.6606	19.9630	20.3594	20.6889	20.8998	20.9707	20.9608	20.8185	20.4011	19.8872	19.4624	19.4624	(89)
Th 2	19.9662	19.9689	19.9715	19.9839	19.9862	19.9970	19.9970	19.9990	19.9928	19.9862	19.9815	19.9766	19.9766	(90)
util rest of house	0.9663	0.9535	0.9246	0.8586	0.7389	0.5554	0.3842	0.4235	0.6673	0.8749	0.9485	0.9704	0.9704	(91)
MIT 2	18.6108	18.7778	19.0750	19.4630	19.7629	19.9417	19.9864	19.9837	19.8819	19.5115	19.0127	18.5891	18.5891	(92)
Living area fraction													fLA = Living area / (4) = 0.2307 (91)	
MIT	18.8143	18.9815	19.2799	19.6698	19.9766	20.1628	20.2135	20.2092	20.0980	19.7168	19.2145	18.7906	18.7906	(92)
Temperature adjustment													0.0000	
adjusted MIT	18.8143	18.9815	19.2799	19.6698	19.9766	20.1628	20.2135	20.2092	20.0980	19.7168	19.2145	18.7906	18.7906	(93)

8. Space heating requirement

Utilisation	0.9583	0.9442	0.9140	0.8497	0.7384	0.5691	0.4069	0.4459	0.6753	0.8665	0.9394	0.9630	0.9630	(94)
Useful gains	546.4531	580.9405	603.7817	599.8920	538.6371	403.1559	275.7346	287.4999	410.0444	489.2469	510.4676	527.0145	527.0145	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	4.2000	(96)
Heat loss rate W	1175.1433	1136.8053	1028.7855	855.3543	655.6633	435.4493	282.8622	297.5148	471.6905	722.2253	964.6480	1168.0484	1168.0484	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	467.7455	373.5411	316.2029	183.9328	87.0675	0.0000	0.0000	0.0000	0.0000	173.3359	327.0098	476.9292	476.9292	(98)
Space heating													2405.7648 (98)	
Space heating per m ²													(98) / (4) = 33.9510 (99)	

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2652.4419 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	467.7455	373.5411	316.2029	183.9328	87.0675	0.0000	0.0000	0.0000	0.0000	173.3359	327.0098	476.9292	(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)	515.7062	411.8424	348.6250	202.7925	95.9951	0.0000	0.0000	0.0000	0.0000	191.1091	360.5401	525.8316	(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	168.9012	148.4232	154.8400	137.3722	133.5812	117.8729	111.7988	124.6251	125.0218	142.5278	152.5072	164.3579	(64)
Efficiency of water heater (217)m	89.7444	89.6765	89.5189	89.1698	88.5483	87.2000	87.2000	87.2000	87.2000	89.0865	89.5568	87.2000	(216)
Fuel for water heating, kWh/month	188.2026	165.5096	172.9691	154.0569	150.8568	135.1754	128.2096	142.9187	143.3737	159.9881	170.2911	183.0746	(219)
Water heating fuel used													1894.6262 (219)
Annual totals kWh/year													
Space heating fuel - main system													2652.4419 (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)													347.2306 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.75 * 908 * 1.00) =													-544.7125 (233)
Total delivered energy for all uses													4424.5862 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2652.4419	3.4800	92.3050 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1894.6262	3.4800	65.9330 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	347.2306	13.1900	45.7997 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-544.7125	13.1900	-71.8476 (252)
Total energy cost			262.0826 (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] =	0.9501 (257)
SAP value		86.7466
SAP rating (Section 12)		87 (258)
SAP band		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2652.4419	0.2160	572.9275 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1894.6262	0.2160	409.2393 (264)
Space and water heating			982.1667 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	347.2306	0.5190	180.2127 (268)
Energy saving/generation technologies			
PV Unit	-544.7125	0.5190	-282.7058 (269)
Total kg/year			918.5986 (272)
CO2 emissions per m2			12.9600 (273)
EI value			89.3758
EI rating			89 (274)
EI band			B

Calculation of stars for heating and DHW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9070 = 3.837$, 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	$3.48 / 0.8866 = 3.925$, stars = 4
Water heating environmental impact	$0.216 / 0.8866 = 0.2436$, 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 (m2)	Storey height (m)	Volume (m3)
Ground floor	35.4300 (1b)	x 2.3900 (2b)	= 84.6777 (1b) - (3b)
First floor	35.4300 (1c)	x 2.6100 (2c)	= 92.4723 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.8600		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 177.1500 (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) = 0.1693 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4193 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3564 (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												
Effective ac	0.4545	0.4188	0.4099	0.3832	0.3832	0.3564	0.3564	0.3475	0.3564	0.4010	0.3921	0.4188 (22b)
	0.6033	0.5877	0.5840	0.5734	0.5734	0.5635	0.5635	0.5604	0.5635	0.5804	0.5769	0.5877 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Front Door			2.1500	1.1000	2.3650		(26)
Windows & Fully Glazed Do (Uw = 1.20)			8.6200	1.1450	9.8702		(27)
Ground Floor			35.4300	0.1200	4.2516	90.0000	3188.7000 (28a)
Brick and Block	88.3100	10.7700	77.5400	0.2400	18.6096	42.2200	3273.7388 (29a)
Step Party Wall	2.6200		2.6200	0.2600	0.6812	110.0000	288.2000 (29a)
External Roof 1	35.4300		35.4300	0.1000	3.5430	9.1000	322.4130 (30)
Total net area of external elements Aum(A, m2)			161.7900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.3206		(33)
Party Wall 1			34.8900	0.0000	0.0000	45.0000	1570.0500 (32)
GF Timber Stud			52.5200			9.0000	472.6800 (32c)
FF Timber Stud			73.8700			9.0000	664.8300 (32c)
Internal Floor 1			35.4300			18.0000	637.7400 (32d)
Internal Ceiling 1			35.4300			18.0000	637.7400 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	11056.0918 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							156.0273 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.3772 (36)
Total fabric heat loss						(33) + (36) =	45.6978 (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	35.2669	34.3570	34.1412	33.5214	33.5214	32.9435	32.9435	32.7601	32.9435	33.9300	33.7234	34.3570 (38)
Average = Sum(39)m / 12 =	80.9647	80.0548	79.8390	79.2193	79.2193	78.6413	78.6413	78.4579	78.6413	79.6278	79.4212	80.0548 (39)
												79.3986 (39)
HLP	1.1426	1.1298	1.1267	1.1180	1.1180	1.1098	1.1098	1.1072	1.1098	1.1237	1.1208	1.1298 (40)
HLP (average)												1.1205 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.2668 (42)
Average daily hot water use (litres/day)												88.0370 (43)
Daily hot water use	96.8407	93.3192	89.7977	86.2763	82.7548	79.2333	79.2333	82.7548	86.2763	89.7977	93.3192	96.8407 (44)
Energy conte	143.6120	125.6039	129.6120	112.9989	108.4251	93.5626	86.6995	99.4890	100.6772	117.3296	128.0744	139.0805 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Energy content (annual)													Total = Sum(45)m =	1385.1649 (45)
Distribution loss (46)m = 0.15 x (45)m														
	21.5418	18.8406	19.4418	16.9498	16.2638	14.0344	13.0049	14.9233	15.1016	17.5994	19.2112	20.8621	20.8621	(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	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	0.0000	(57)
Combi loss	25.2893	22.8192	25.2280	24.3733	25.1560	24.3103	25.0992	25.1361	24.3446	25.1982	24.4328	25.2774	25.2774	(61)
Total heat required for water heating calculated for each month	168.9012	148.4232	154.8400	137.3722	133.5812	117.8729	111.7988	124.6251	125.0218	142.5278	152.5072	164.3579	164.3579	(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	0.0000	(63)
Solar input (sum of months) = Sum(63)m =													0.0000 (63)	
Output from w/h	168.9012	148.4232	154.8400	137.3722	133.5812	117.8729	111.7988	124.6251	125.0218	142.5278	152.5072	164.3579	164.3579	(64)
Total per year (kWh/year) = Sum(64)m =													1681.8295 (64)	
Heat gains from water heating, kWh/month	54.0733	47.4681	49.4030	43.6655	42.3404	37.1871	35.1024	39.3641	39.5613	45.3116	48.6929	52.5636	52.5636	(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		
	136.0093	136.0093	136.0093	136.0093	136.0093	136.0093	136.0093	136.0093	136.0093	136.0093	136.0093	136.0093	136.0093	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	49.1541	43.6582	35.5053	26.8798	20.0929	16.9633	18.3294	23.8253	31.9783	40.6038	47.3906	50.5202	50.5202	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	297.4565	300.5432	292.7649	276.2058	255.3029	235.6572	222.5326	219.4459	227.2242	243.7833	264.6862	284.3319	284.3319	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.8677	50.8677	50.8677	50.8677	50.8677	50.8677	50.8677	50.8677	50.8677	50.8677	50.8677	50.8677	50.8677	(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	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	(71)
Water heating gains (Table 5)	72.6792	70.6371	66.4019	60.6465	56.9091	51.6488	47.1807	52.9087	54.9463	60.9028	67.6291	70.6500	70.6500	(72)
Total internal gains	518.4939	514.0427	493.8762	462.9362	431.5091	403.4735	387.2469	395.3842	413.3530	444.4940	478.9101	504.7064	504.7064	(73)

6. Solar gains

[Jan]			Area	Solar flux		g	FF	Access		Gains				
			m ²	Table 6a	W/m ²	Specific data	Specific data	factor	Table 6d		W			
						or Table 6b	or Table 6c							
East			3.5300	25.9136	0.6300	0.7000	0.7700	27.9560			(76)			
West			5.0900	25.9136	0.6300	0.7000	0.7700	40.3105			(80)			
Solar gains	68.2665	114.0333	186.1415	275.0155	320.8254	354.9870	330.0403	290.2837	229.0755	142.9595	84.3343	53.6049	53.6049	(83)
Total gains	586.7604	628.0759	680.0177	737.9517	752.3346	758.4605	717.2872	685.6678	642.4285	587.4536	563.2443	558.3113	558.3113	(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	37.9318	38.3629	38.4666	38.7676	38.7676	39.0525	39.0525	39.1437	39.0525	38.5687	38.6690	38.3629	38.3629	
alpha	3.5288	3.5575	3.5644	3.5845	3.5845	3.6035	3.6035	3.6096	3.6035	3.5712	3.5779	3.5575	3.5575	
util living area	0.9631	0.9525	0.9215	0.8532	0.7316	0.5432	0.3962	0.4122	0.6499	0.8583	0.9397	0.9670	0.9670	(86)
MIT	19.6813	19.8121	20.1137	20.4799	20.7813	20.9460	20.9870	20.9854	20.8965	20.5664	20.1043	19.6712	19.6712	(87)
Th 2	19.9662	19.9766	19.9791	19.9862	19.9862	19.9928	19.9928	19.9949	19.9928	19.9815	19.9839	19.9766	19.9766	(88)
util rest of house	0.9553	0.9427	0.9051	0.8223	0.6751	0.4584	0.2927	0.3053	0.5662	0.8197	0.9251	0.9600	0.9600	(89)
MIT 2	18.7971	18.9324	19.2262	19.5755	19.8394	19.9671	19.9893	19.9909	19.9378	19.6589	19.2258	18.7957	18.7957	(90)
Living area fraction													fLA = Living area / (4) = 0.2307 (91)	
MIT	19.0011	19.1354	19.4310	19.7842	20.0567	20.1930	20.2195	20.2204	20.1590	19.8683	19.4285	18.9977	18.9977	(92)
Temperature adjustment													0.0000	
adjusted MIT	19.0011	19.1354	19.4310	19.7842	20.0567	20.1930	20.2195	20.2204	20.1590	19.8683	19.4285	18.9977	18.9977	(93)

8. Space heating requirement

Utilisation	0.9462	0.9328	0.8946	0.8153	0.6794	0.4760	0.3165	0.3299	0.5810	0.8148	0.9152	0.9515	0.9515	(94)
Useful gains	555.2118	585.8916	608.3227	601.6669	511.1209	361.0288	227.0071	226.1901	373.2670	478.6488	515.4982	531.2174	531.2174	(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	5.5000	(96)
Heat loss rate W	1101.2083	1075.5703	968.5277	806.7831	590.7136	376.9245	229.5950	229.1273	405.7091	642.4596	875.8956	1080.5584	1080.5584	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	406.2214	329.0641	267.9925	147.6836	59.2169	0.0000	0.0000	0.0000	0.0000	121.8752	259.4861	408.7097	408.7097	(98)
Space heating per m ²													(98) / (4) = 28.2282 (99)	

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Not applicable

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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													2205.3468 (211)
Space heating requirement	406.2214	329.0641	267.9925	147.6836	59.2169	0.0000	0.0000	0.0000	0.0000	121.8752	259.4861	408.7097	(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)	447.8736	362.8050	295.4714	162.8265	65.2888	0.0000	0.0000	0.0000	0.0000	134.3718	286.0928	450.6171	(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	168.9012	148.4232	154.8400	137.3722	133.5812	117.8729	111.7988	124.6251	125.0218	142.5278	152.5072	164.3579	(64)
Efficiency of water heater (217)m	89.6433	89.5823	89.3862	88.9789	88.2459	87.2000	87.2000	87.2000	87.2000	88.7791	89.3721	87.2000	(216)
Fuel for water heating, kWh/month	188.4147	165.6835	173.2259	154.3874	151.3738	135.1754	128.2096	142.9187	143.3737	160.5420	170.6429	183.2966	(219)
Water heating fuel used													1897.2442 (219)
Annual totals kWh/year													
Space heating fuel - main system													2205.3468 (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)													347.2306 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.75 * 1054 * 1.00) =													-632.6656 (233)
Total delivered energy for all uses													3892.1560 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2205.3468	9.7400	214.8008 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1897.2442	9.7400	184.7916 (247)
Pumps and fans for heating	75.0000	36.8500	27.6375 (249)
Energy for lighting	347.2306	36.8500	127.9545 (250)
Additional standing charges			104.0000 (251)
Energy saving/generation technologies			
PV Unit	-632.6656	36.8500	-233.1373 (252)
Total energy cost			426.0471 (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	2205.3468	0.2160	476.3549 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1897.2442	0.2160	409.8048 (264)
Space and water heating			886.1597 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	347.2306	0.5190	180.2127 (268)
Energy saving/generation technologies			
PV Unit	-632.6656	0.5190	-328.3535 (269)
Total kg/year			776.9439 (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	2205.3468	1.2200	2690.5231 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1897.2442	1.2200	2314.6380 (264)
Space and water heating			5005.1610 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	347.2306	3.0700	1065.9980 (268)
Energy saving/generation technologies			
PV Unit	-632.6656	3.0700	-1942.2834 (269)
Primary energy kWh/year			4359.1256 (272)
Primary energy kWh/m2/year			61.5174 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 87
 Current environmental impact rating: B 89

(For testing purposes):

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

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.3	-£ 77	-185 kg (23.8%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£77	2.61 kg/m ²	B 88 B 91
Total Savings	£77	2.61 kg/m ²	

Potential energy efficiency rating: B 88
 Potential environmental impact rating: B 91

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	£156	£174	-£18
Mains gas	£504	£408	£95
Space heating	£346	£346	£0
Water heating	£185	£108	£77
Lighting	£128	£128	£0
Generated (PV)	-£233	-£233	£0
Total cost of fuels	£427	£349	£77
Total cost of uses	£426	£349	£77
Delivered energy	55 kWh/m ²	42 kWh/m ²	13 kWh/m ²
Carbon dioxide emissions	0.8 tonnes	0.6 tonnes	0.2 tonnes
CO2 emissions per m ²	11 kg/m ²	8 kg/m ²	3 kg/m ²
Primary energy	62 kWh/m ²	47 kWh/m ²	15 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

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	35.4300 (1b)	x 2.3900 (2b)	= 84.6777 (1b) - (3b)
First floor	35.4300 (1c)	x 2.6100 (2c)	= 92.4723 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.8600		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 177.1500 (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) = 0.1693 (8)							
Pressure test					Yes							
Measured/design AP50					5.0000							
Infiltration rate					0.4193 (18)							
Number of sides sheltered					2 (19)							
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)							
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3564 (21)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4545	0.4456	0.4366	0.3921	0.3832	0.3386	0.3386	0.3297	0.3564	0.3832	0.4010	0.4188 (22b)
	0.6033	0.5993	0.5953	0.5769	0.5734	0.5573	0.5573	0.5544	0.5635	0.5734	0.5804	0.5877 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Front Door			2.1500	1.1000	2.3650		(26)
Windows & Fully Glazed Do (Uw = 1.20)			8.6200	1.1450	9.8702		(27)
Ground Floor			35.4300	0.1200	4.2516	90.0000	3188.7000 (28a)
Brick and Block	88.3100	10.7700	77.5400	0.2400	18.6096	42.2200	3273.7388 (29a)
Step Party Wall	2.6200		2.6200	0.2600	0.6812	110.0000	288.2000 (29a)
External Roof 1	35.4300		35.4300	0.1000	3.5430	9.1000	322.4130 (30)
Total net area of external elements Aum(A, m2)			161.7900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.3206		(33)
Party Wall 1			34.8900	0.0000	0.0000	45.0000	1570.0500 (32)
GF Timber Stud			52.5200			9.0000	472.6800 (32c)
FF Timber Stud			73.8700			9.0000	664.8300 (32c)
Internal Floor 1			35.4300			18.0000	637.7400 (32d)
Internal Ceiling 1			35.4300			18.0000	637.7400 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	11056.0918 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							156.0273 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.3772 (36)
Total fabric heat loss						(33) + (36) =	45.6978 (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	35.2669	35.0325	34.8027	33.7234	33.5214	32.5814	32.5814	32.4073	32.9435	33.5214	33.9300	34.3570 (38)
Average = Sum(39)m / 12 =	80.9647	80.7303	80.5005	79.4212	79.2193	78.2792	78.2792	78.1051	78.6413	79.2193	79.6278	80.0548 (39)
												79.4202 (39)
HLP	1.1426	1.1393	1.1360	1.1208	1.1180	1.1047	1.1047	1.1022	1.1098	1.1180	1.1237	1.1298 (40)
HLP (average)												1.1208 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.2668 (42)
Average daily hot water use (litres/day)												88.0370 (43)
Daily hot water use	96.8407	93.3192	89.7977	86.2763	82.7548	79.2333	79.2333	82.7548	86.2763	89.7977	93.3192	96.8407 (44)
Energy conte	143.6120	125.6039	129.6120	112.9989	108.4251	93.5626	86.6995	99.4890	100.6772	117.3296	128.0744	139.0805 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Energy content (annual)												Total = Sum(45)m =	1385.1649 (45)
Distribution loss (46)m = 0.15 x (45)m													
	21.5418	18.8406	19.4418	16.9498	16.2638	14.0344	13.0049	14.9233	15.1016	17.5994	19.2112	20.8621	(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	25.2893	22.8192	25.2280	24.3733	25.1560	24.3103	25.0992	25.1361	24.3446	25.1982	24.4328	25.2774	(61)
Total heat required for water heating calculated for each month	168.9012	148.4232	154.8400	137.3722	133.5812	117.8729	111.7988	124.6251	125.0218	142.5278	152.5072	164.3579	(62)
Aperture area of solar collector												3.0000 (H1)	
Zero-loss collector efficiency												0.7000 (H2)	
Collector heat loss coefficient												1.8000 (H3)	
Collector 2nd order heat loss coefficient												0.0050 (H3a)	
Collector effective heat loss coefficient												1.8063 (H3b)	
Collector performance ratio												2.5804 (H4)	
Annual solar radiation per m2												1079.5246 (H5)	
Overshading factor												0.8000 (H6)	
Solar energy available												1813.6014 (H7)	
Adjustment factor for showers												1.0000 (H7a)	
Solar-to-load ratio												1.3093 (H8)	
Utilisation factor												0.5341 (H9)	
Collector performance factor												0.8793 (H10)	
Dedicated solar storage volume												75.0000 (H11)	
Effective solar volume												75.0000 (H13)	
Daily hot water demand												88.0370 (H14)	
Volume ratio Veff/V												0.8519 (H15)	
Solar storage volume factor												0.9679 (H16)	
Solar input	-23.9062	-39.8925	-67.9416	-91.0551	-112.4909	-110.5965	-109.1349	-95.3517	-74.6795	-50.9973	-28.3562	-824.4078	(H17)
Solar input (sum of months) = Sum(63)m =												-824.4078 (63)	
Output from w/h	144.9951	108.5306	86.8985	46.3171	21.0903	7.2764	2.6639	29.2734	50.3423	91.5305	124.1510	144.3526	(64)
Total per year (kWh/year) = Sum(64)m =												857.4217 (64)	
Heat gains from water heating, kWh/month	54.0733	47.4681	49.4030	43.6655	42.3404	37.1871	35.1024	39.3641	39.5613	45.3116	48.6929	52.5636	(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	136.0093	136.0093	136.0093	136.0093	136.0093	136.0093	136.0093	136.0093	136.0093	136.0093	136.0093	136.0093	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	49.1541	43.6582	35.5053	26.8798	20.0929	16.9633	18.3294	23.8253	31.9783	40.6038	47.3906	50.5202	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	297.4565	300.5432	292.7649	276.2058	255.3029	235.6572	222.5326	219.4459	227.2242	243.7833	264.6862	284.3319	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.8677	50.8677	50.8677	50.8677	50.8677	50.8677	50.8677	50.8677	50.8677	50.8677	50.8677	50.8677	(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)	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	(71)
Water heating gains (Table 5)	72.6792	70.6371	66.4019	60.6465	56.9091	51.6488	47.1807	52.9087	54.9463	60.9028	67.6291	70.6500	(72)
Total internal gains	518.4939	514.0427	493.8762	462.9362	431.5091	403.4735	387.2469	395.3842	413.3530	444.4940	478.9101	504.7064	(73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains							
	m2	Table 6a	Specific data	Specific data	factor	W							
		W/m2	or Table 6b	or Table 6c	Table 6d								
East	3.5300	19.6403	0.6300	0.7000	0.7700	21.1882 (76)							
West	5.0900	19.6403	0.6300	0.7000	0.7700	30.5518 (80)							
Solar gains	51.7400	101.2144	166.6857	243.1012	297.9296	304.9840	290.3572	249.4125	193.8624	120.0994	64.5137	42.5485	(83)
Total gains	570.2339	615.2571	660.5619	706.0374	729.4388	708.4574	677.6041	644.7967	607.2154	564.5934	543.4237	547.2548	(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	37.9318	38.0419	38.1505	38.6690	38.7676	39.2331	39.2331	39.3205	39.0525	38.7676	38.5687	38.3629	
alpha	3.5288	3.5361	3.5434	3.5779	3.5845	3.6155	3.6155	3.6214	3.6035	3.5845	3.5712	3.5575	
util living area	0.9720	0.9613	0.9376	0.8836	0.7858	0.6330	0.4857	0.5254	0.7368	0.9013	0.9583	0.9754	(86)
MIT	19.4925	19.6606	19.9630	20.3594	20.6889	20.8998	20.9707	20.9608	20.8185	20.4011	19.8872	19.4624	(87)
Th 2	19.9662	19.9689	19.9715	19.9839	19.9862	19.9970	19.9970	19.9990	19.9928	19.9862	19.9815	19.9766	(88)
util rest of house	0.9663	0.9535	0.9246	0.8586	0.7389	0.5554	0.3842	0.4235	0.6673	0.8749	0.9485	0.9704	(89)
MIT 2	18.6108	18.7778	19.0750	19.4630	19.7629	19.9417	19.9864	19.9837	19.8819	19.5115	19.0127	18.5891	(90)
Living area fraction												fLA = Living area / (4) =	
MIT	18.8143	18.9815	19.2799	19.6698	19.9766	20.1628	20.2135	20.2092	20.0980	19.7168	19.2145	18.7906	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8143	18.9815	19.2799	19.6698	19.9766	20.1628	20.2135	20.2092	20.0980	19.7168	19.2145	18.7906	(93)

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Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9583	0.9442	0.9140	0.8497	0.7384	0.5691	0.4069	0.4459	0.6753	0.8665	0.9394	0.9630	(94)
Useful gains	546.4531	580.9405	603.7817	599.8920	538.6371	403.1559	275.7346	287.4999	410.0444	489.2469	510.4676	527.0145	(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													
Month fracti	1175.1433	1136.8053	1028.7855	855.3543	655.6633	435.4493	282.8622	297.5148	471.6905	722.2253	964.6480	1168.0484	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating	467.7455	373.5411	316.2029	183.9328	87.0675	0.0000	0.0000	0.0000	0.0000	173.3359	327.0098	476.9292	(98)
Space heating per m2												2405.7648	(98)
												(98) / (4) =	33.9510 (99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2652.4419 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	467.7455	373.5411	316.2029	183.9328	87.0675	0.0000	0.0000	0.0000	0.0000	173.3359	327.0098	476.9292	(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)	515.7062	411.8424	348.6250	202.7925	95.9951	0.0000	0.0000	0.0000	0.0000	191.1091	360.5401	525.8316	(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	144.9951	108.5306	86.8985	46.3171	21.0903	7.2764	2.6639	29.2734	50.3423	91.5305	124.1510	144.3526	(64)
Efficiency of water heater	89.8466	89.8877	89.9219	89.9735	89.9956	87.2000	87.2000	87.2000	87.2000	89.4592	89.7092	89.8620	(217)
Fuel for water heating, kWh/month	161.3806	120.7402	96.6377	51.4786	23.4348	8.3445	3.0549	33.5704	57.7320	102.3154	138.3928	160.6381	(219)
Water heating fuel used												957.7201	(219)
Annual totals kWh/year													
Space heating fuel - main system													2652.4419 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
pump for solar water heating													50.0000 (230g)
Total electricity for the above, kWh/year													125.0000 (231)
Electricity for lighting (calculated in Appendix L)													347.2306 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.75 * 908 * 1.00) =										-544.7125			-544.7125 (233)
Total delivered energy for all uses													3537.6801 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2652.4419	3.4800	92.3050	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	957.7201	3.4800	33.3287	(247)
Pumps and fans for heating	75.0000	13.1900	9.8925	(249)
Pump for solar water heating	50.0000	13.1900	6.5950	(249)
Energy for lighting	347.2306	13.1900	45.7997	(250)
Additional standing charges			120.0000	(251)
Energy saving/generation technologies				
PV Unit	-544.7125	13.1900	-71.8476	(252)
Total energy cost			236.0733	(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] =	0.8558 (257)
SAP value		88.0619
SAP rating (Section 12)		88 (258)
SAP band		B

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

Energy Emission factor Emissions

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

	kWh/year	kg CO2/kWh	kg CO2/year
Space heating - main system 1	2652.4419	0.2160	572.9275 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	957.7201	0.2160	206.8675 (264)
Space and water heating			779.7950 (265)
Pumps and fans	125.0000	0.5190	64.8750 (267)
Energy for lighting	347.2306	0.5190	180.2127 (268)
Energy saving/generation technologies			
PV Unit	-544.7125	0.5190	-282.7058 (269)
Total kg/year			742.1769 (272)
CO2 emissions per m2			10.4700 (273)
EI value			91.4162
EI rating			91 (274)
EI band			B

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	35.4300 (1b)	x 2.3900 (2b)	= 84.6777 (1b) - (3b)
First floor	35.4300 (1c)	x 2.6100 (2c)	= 92.4723 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.8600		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 177.1500 (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) = 0.1693 (8)							
Pressure test					Yes							
Measured/design AP50					5.0000							
Infiltration rate					0.4193 (18)							
Number of sides sheltered					2 (19)							
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)							
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3564 (21)							
Wind speed	Jan 5.1000	Feb 4.7000	Mar 4.6000	Apr 4.3000	May 4.3000	Jun 4.0000	Jul 4.0000	Aug 3.9000	Sep 4.0000	Oct 4.5000	Nov 4.4000	Dec 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	0.4545	0.4188	0.4099	0.3832	0.3832	0.3564	0.3564	0.3475	0.3564	0.4010	0.3921	0.4188 (22b)
Effective ac	0.6033	0.5877	0.5840	0.5734	0.5734	0.5635	0.5635	0.5604	0.5635	0.5804	0.5769	0.5877 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Front Door			2.1500	1.1000	2.3650		(26)
Windows & Fully Glazed Do (Uw = 1.20)			8.6200	1.1450	9.8702		(27)
Ground Floor			35.4300	0.1200	4.2516	90.0000	3188.7000 (28a)
Brick and Block	88.3100	10.7700	77.5400	0.2400	18.6096	42.2200	3273.7388 (29a)
Step Party Wall	2.6200		2.6200	0.2600	0.6812	110.0000	288.2000 (29a)
External Roof 1	35.4300		35.4300	0.1000	3.5430	9.1000	322.4130 (30)
Total net area of external elements Aum(A, m2)			161.7900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.3206		(33)
Party Wall 1			34.8900	0.0000	0.0000	45.0000	1570.0500 (32)
GF Timber Stud			52.5200			9.0000	472.6800 (32c)
FF Timber Stud			73.8700			9.0000	664.8300 (32c)
Internal Floor 1			35.4300			18.0000	637.7400 (32d)
Internal Ceiling 1			35.4300			18.0000	637.7400 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 11056.0918 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							156.0273 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.3772 (36)
Total fabric heat loss							(33) + (36) = 45.6978 (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	35.2669	34.3570	34.1412	33.5214	33.5214	32.9435	32.9435	32.7601	32.9435	33.9300	33.7234	34.3570 (38)
Average = Sum(39)m / 12 =	80.9647	80.0548	79.8390	79.2193	79.2193	78.6413	78.6413	78.4579	78.6413	79.6278	79.4212	80.0548 (39)
HLP	1.1426	1.1298	1.1267	1.1180	1.1180	1.1098	1.1098	1.1072	1.1098	1.1237	1.1208	1.1298 (40)
HLP (average)												1.1205 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.2668 (42)
Average daily hot water use (litres/day)												88.0370 (43)
Daily hot water use	96.8407	93.3192	89.7977	86.2763	82.7548	79.2333	79.2333	82.7548	86.2763	89.7977	93.3192	96.8407 (44)
Energy conte	143.6120	125.6039	129.6120	112.9989	108.4251	93.5626	86.6995	99.4890	100.6772	117.3296	128.0744	139.0805 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Energy content (annual)												Total = Sum(45)m =	1385.1649 (45)
Distribution loss (46)m = 0.15 x (45)m													
	21.5418	18.8406	19.4418	16.9498	16.2638	14.0344	13.0049	14.9233	15.1016	17.5994	19.2112	20.8621	(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	25.2893	22.8192	25.2280	24.3733	25.1560	24.3103	25.0992	25.1361	24.3446	25.1982	24.4328	25.2774	(61)
Total heat required for water heating calculated for each month	168.9012	148.4232	154.8400	137.3722	133.5812	117.8729	111.7988	124.6251	125.0218	142.5278	152.5072	164.3579	(62)
Aperture area of solar collector												3.0000 (H1)	
Zero-loss collector efficiency												0.7000 (H2)	
Collector heat loss coefficient												1.8000 (H3)	
Collector 2nd order heat loss coefficient												0.0050 (H3a)	
Collector effective heat loss coefficient												1.8063 (H3b)	
Collector performance ratio												2.5804 (H4)	
Annual solar radiation per m2												1234.4649 (H5)	
Overshading factor												0.8000 (H6)	
Solar energy available												2073.9010 (H7)	
Adjustment factor for showers												1.0000 (H7a)	
Solar-to-load ratio												1.4972 (H8)	
Utilisation factor												0.4872 (H9)	
Collector performance factor												0.8793 (H10)	
Dedicated solar storage volume												75.0000 (H11)	
Effective solar volume												75.0000 (H13)	
Daily hot water demand												88.0370 (H14)	
Volume ratio Veff/V												0.8519 (H15)	
Solar storage volume factor												0.9679 (H16)	
Solar input												-859.9947 (H17)	
Solar input	-28.2222	-40.2881	-68.2814	-93.1742	-109.9660	-117.0246	-112.7041	-100.5469	-79.5770	-54.4862	-33.1809	-22.5432	(63)
												Solar input (sum of months) = Sum(63)m =	-859.9947 (63)
Output from w/h	140.6790	108.1351	86.5586	44.1980	23.6152	0.8484	0.0000	24.0782	45.4449	88.0417	119.3264	141.8147	(64)
												Total per year (kWh/year) = Sum(64)m =	822.7401 (64)
Heat gains from water heating, kWh/month	54.0733	47.4681	49.4030	43.6655	42.3404	37.1871	35.1024	39.3641	39.5613	45.3116	48.6929	52.5636	(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	136.0093	136.0093	136.0093	136.0093	136.0093	136.0093	136.0093	136.0093	136.0093	136.0093	136.0093	136.0093	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	49.1541	43.6582	35.5053	26.8798	20.0929	16.9633	18.3294	23.8253	31.9783	40.6038	47.3906	50.5202	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	297.4565	300.5432	292.7649	276.2058	255.3029	235.6572	222.5326	219.4459	227.2242	243.7833	264.6862	284.3319	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.8677	50.8677	50.8677	50.8677	50.8677	50.8677	50.8677	50.8677	50.8677	50.8677	50.8677	50.8677	(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)	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	(71)
Water heating gains (Table 5)	72.6792	70.6371	66.4019	60.6465	56.9091	51.6488	47.1807	52.9087	54.9463	60.9028	67.6291	70.6500	(72)
Total internal gains	518.4939	514.0427	493.8762	462.9362	431.5091	403.4735	387.2469	395.3842	413.3530	444.4940	478.9101	504.7064	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b g	Specific data or Table 6c FF	Access factor Table 6d	Gains W							
East	3.5300	25.9136	0.6300	0.7000	0.7700	27.9560 (76)							
West	5.0900	25.9136	0.6300	0.7000	0.7700	40.3105 (80)							
Solar gains	68.2665	114.0333	186.1415	275.0155	320.8254	354.9870	330.0403	290.2837	229.0755	142.9595	84.3343	53.6049	(83)
Total gains	586.7604	628.0759	680.0177	737.9517	752.3346	758.4605	717.2872	685.6678	642.4285	587.4536	563.2443	558.3113	(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	37.9318	38.3629	38.4666	38.7676	38.7676	39.0525	39.0525	39.1437	39.0525	38.5687	38.6690	38.3629	(86)
alpha	3.5288	3.5575	3.5644	3.5845	3.5845	3.6035	3.6035	3.6096	3.6035	3.5712	3.5779	3.5575	
util living area	0.9631	0.9525	0.9215	0.8532	0.7316	0.5432	0.3962	0.4122	0.6499	0.8583	0.9397	0.9670	(86)
MIT	19.6813	19.8121	20.1137	20.4799	20.7813	20.9460	20.9870	20.9854	20.8965	20.5664	20.1043	19.6712	(87)
Th 2	19.9662	19.9766	19.9791	19.9862	19.9862	19.9928	19.9928	19.9949	19.9928	19.9815	19.9839	19.9766	(88)
util rest of house	0.9553	0.9427	0.9051	0.8223	0.6751	0.4584	0.2927	0.3053	0.5662	0.8197	0.9251	0.9600	(89)
MIT 2	18.7971	18.9324	19.2262	19.5755	19.8394	19.9671	19.9893	19.9909	19.9378	19.6589	19.2258	18.7957	(90)
Living area fraction												fLA = Living area / (4) =	0.2307 (91)
MIT	19.0011	19.1354	19.4310	19.7842	20.0567	20.1930	20.2195	20.2204	20.1590	19.8683	19.4285	18.9977	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0011	19.1354	19.4310	19.7842	20.0567	20.1930	20.2195	20.2204	20.1590	19.8683	19.4285	18.9977	(93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9462	0.9328	0.8946	0.8153	0.6794	0.4760	0.3165	0.3299	0.5810	0.8148	0.9152	0.9515	(94)
Useful gains	555.2118	585.8916	608.3227	601.6669	511.1209	361.0288	227.0071	226.1901	373.2670	478.6488	515.4982	531.2174	(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	1101.2083	1075.5703	968.5277	806.7831	590.7136	376.9245	229.5950	229.1273	405.7091	642.4596	875.8956	1080.5584	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	406.2214	329.0641	267.9925	147.6836	59.2169	0.0000	0.0000	0.0000	0.0000	121.8752	259.4861	408.7097	(98)
Space heating												2000.2495	(98)
Space heating per m2												(98) / (4) =	28.2282 (99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2205.3468 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	406.2214	329.0641	267.9925	147.6836	59.2169	0.0000	0.0000	0.0000	0.0000	121.8752	259.4861	408.7097	(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)	447.8736	362.8050	295.4714	162.8265	65.2888	0.0000	0.0000	0.0000	0.0000	134.3718	286.0928	450.6171	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	140.6790	108.1351	86.5586	44.1980	23.6152	0.8484	0.0000	24.0782	45.4449	88.0417	119.3264	141.8147	(64)
Efficiency of water heater	89.7731	89.8084	89.8199	89.8691	89.6739	87.2000	87.2000	87.2000	87.2000	89.1984	89.5676	89.7718	(216)
(217)m	89.7731	89.8084	89.8199	89.8691	89.6739	87.2000	87.2000	87.2000	87.2000	89.1984	89.5676	89.7718	(217)
Fuel for water heating, kWh/month	156.7050	120.4064	96.3691	49.1804	26.3346	0.9729	0.0000	27.6126	52.1157	98.7032	133.2250	157.9724	(219)
Water heating fuel used												919.5973	(219)
Annual totals kWh/year													
Space heating fuel - main system													2205.3468 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
pump for solar water heating													50.0000 (230g)
Total electricity for the above, kWh/year													125.0000 (231)
Electricity for lighting (calculated in Appendix L)													347.2306 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.75 * 1054 * 1.00) =										-632.6656			-632.6656 (233)
Total delivered energy for all uses													2964.5091 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2205.3468	9.7400	214.8008	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	919.5973	9.7400	89.5688	(247)
Pumps and fans for heating	75.0000	36.8500	27.6375	(249)
Pump for solar water heating	50.0000	36.8500	18.4250	(249)
Energy for lighting	347.2306	36.8500	127.9545	(250)
Additional standing charges			104.0000	(251)
Energy saving/generation technologies				
PV Unit	-632.6656	36.8500	-233.1373	(252)
Total energy cost			349.2493	(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	2205.3468	0.2160	476.3549	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	919.5973	0.2160	198.6330	(264)
Space and water heating			674.9879	(265)
Pumps and fans	125.0000	0.5190	64.8750	(267)
Energy for lighting	347.2306	0.5190	180.2127	(268)
Energy saving/generation technologies				
PV Unit	-632.6656	0.5190	-328.3535	(269)
Total kg/year			591.7222	(272)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2205.3468	1.2200	2690.5231 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	919.5973	1.2200	1121.9087 (264)
Space and water heating			3812.4318 (265)
Pumps and fans	125.0000	3.0700	383.7500 (267)
Energy for lighting	347.2306	3.0700	1065.9980 (268)
Energy saving/generation technologies			
PV Unit	-632.6656	3.0700	-1942.2834 (269)
Primary energy kWh/year			3319.8963 (272)
Primary energy kWh/m2/year			46.8515 (273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0879 Plot 117		Issued on Date	28/03/2023
Assessment Reference	Rev A	Prop Type Ref	2B AFF (HA/SO)	
Project	Plot 117			
Calculation Type	New Build (As Designed)			

SAP Rating	87 B	DER	14.89	TER	19.34
Environmental	89 B	% DER<TER	23.03		
CO ₂ Emissions (t/year)	0.78	DFEE	45.27	TFEE	52.79
General Requirements Compliance	Pass	% DFEE<TFEE	14.24		

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 Corrections - Air Gap: Level 1, Fasteners: None or plastic	150	0.0400	3.7500	100.00		
Layer 2	Earthwool Loft Roll 40 Main construction Corrections - Air Gap: Level 1, Fasteners: None or plastic	200	0.0400	5.0000	100.00		
Layer 3	Earthwool Loft Roll 40 Main construction Main construction Corrections - Air Gap: Level 1, Fasteners: None or plastic	100 100	0.0400 0.1300	2.5000 0.7692	87.50 12.50		
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 m² K/W Lower limit = 10.901 m² K/W Average = 11.050 m² K/W
Total correction = 0.0065 m² K/W U-value (unrounded) = 0.1 W/m² 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 117	Issued on Date	28/03/2023
Assessment Reference	Rev A	Prop Type Ref	2B AFF (HA/SO)
Project	Plot 117		
Calculation Type	New Build (As Designed)		

SAP Rating	87 B	DER	14.89	TER	19.34
Environmental	89 B	% DER<TER	23.03		
CO ₂ Emissions (t/year)	0.78	DFEE	45.27	TFEE	52.79
General Requirements Compliance	Pass	% DFEE<TFEE	14.24		

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 m² K/W Lower limit = 4.110 m² K/W Average = 4.215 m² K/W
 Total correction = 0.0002 m² K/W U-value (unrounded) = 0.24 W/m² K

Unheated space: None
Total thickness: 330 mm U-value: 0.24 W/m ² K Kappa: 42.22 kJ/m ² K

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0879 Plot 117	Issued on Date	28/03/2023
Assessment Reference	Rev A	Prop Type Ref	2B AFF (HA/SO)
Project	Plot 117		
Calculation Type	New Build (As Designed)		

SAP Rating	87 B	DER	14.89	TER	19.34
Environmental	89 B	% DER<TER	23.03		
CO ₂ Emissions (t/year)	0.78	DFEE	45.27	TFEE	52.79
General Requirements Compliance	Pass	% DFEE<TFEE	14.24		

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 Party Step

Wall Type: Standard Wall

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)
Ext surface				0.0400	
Layer 1	Supabloc *7				
	Main construction	100	0.1900	0.5263	94.04
	Main construction	100	0.8803	0.1136	5.96
	Corrections - Air Gap: Level 1, Fasteners: None or plastic				
Layer 2	Supafil Party Wall				
	Main construction	100	0.0400	2.5000	100.00
	Corrections - Air Gap: Level 0, Fasteners: None or plastic				
Layer 3	Supabloc *7				
	Main construction	100	0.1900	0.5263	94.04
	Main construction	100	0.8803	0.1136	5.96
	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
Int surface				0.1300	

Total resistance: Upper limit = 3.898 m² K/W Lower limit = 3.765 m² K/W Average = 3.831 m² K/W
 Total correction = 0.0003 m² K/W U-value (unrounded) = 0.26 W/m² K

Unheated space:	None
Total thickness: 328 mm	U-value: 0.26 W/m² K
	Kappa: n/a

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0879 Plot 117	Issued on Date	28/03/2023
Assessment Reference	Rev A	Prop Type Ref	2B AFF (HA/SO)
Project	Plot 117		
Calculation Type	New Build (As Designed)		

SAP Rating	87 B	DER	14.89	TER	19.34
Environmental	89 B	% DER<TER	23.03		
CO ₂ Emissions (t/year)	0.78	DFEE	45.27	TFEE	52.79
General Requirements Compliance	Pass	% DFEE<TFEE	14.24		

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

Floor 000003

Floor Type: Suspended Floor

Area = 46.25 m², Perimeter = 19.32 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 117	Issued on Date	28/03/2023
Assessment Reference	Rev A	Prop Type Ref	2B AFF (HA/SO)
Property	Plot 117		

SAP Rating	87 B	DER	14.89	TER	19.34
Environmental	89 B	% DER<TER	23.03		
CO ₂ Emissions (t/year)	0.78	DFEE	45.27	TFEE	52.79
General Requirements Compliance	Pass	% DFEE<TFEE	14.24		

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

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

6.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground Floor:	16.82 m	35.43 m ²	2.39 m
1st Storey:	16.82 m	35.43 m ²	2.61 m

7.0 Living Area	16.35	m ²
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8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	156.03	kJ/m ² K

9.0 External Walls

Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Brick and Block	Cavity Wall	Other	0.24	42.22	88.31	77.54
Step Party Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.26	110.00	2.62	2.62

9.1 Party Walls

Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)
Party Wall 1	Filled Cavity with Edge Sealing	Plasterboard on dabs mounted on cement render on both sides, AAC blocks, cavity	0.00	45.00	34.89

9.2 Internal Walls

Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
GF Timber Stud	Plasterboard on timber frame	9.00	52.52
FF Timber Stud	Plasterboard on timber frame	9.00	73.87

10.0 External Roofs

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
External Roof 1	External Plane Roof	Other	0.10	9.10	35.43	35.43

10.2 Internal Ceilings

Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
Internal Ceiling 1	Plasterboard ceiling, carpeted chipboard floor	9.00	35.43

11.0 Heat Loss Floors

Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)
Ground Floor	Ground Floor - Solid	Other	0.12	90.00	35.43

11.2 Internal Floors

Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
Internal Floor 1	Plasterboard ceiling, carpeted chipboard floor	18.00	35.43

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m ² K)
Front Door	Manufacture	Solid Door							1.10
Windows & Fully Glazed Door	Manufacture	Window	Double Low-E Soft 0.1			0.63		0.70	1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m ²)	Curtain Closed
Front Door	Solid Door	[1] Brick and Block	East							2.15	
Front Elevation	Window	[1] Brick and Block	East	None	0.00					3.53	
Rear Elevation	Window	[1] Brick and Block	West	None	0.00					5.09	

14.0 Conservatory

15.0 Draught Proofing

 %

16.0 Draught Lobby

17.0 Thermal Bridging

17.1 List of Bridges

Source Type	Bridge Type	Length	Psi	Imported	Reference:
Independently assessed	E2 Other lintels (including other steel lintels)	0.69	0.077	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	0.91	0.070	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	1.02	0.071	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	4.99	0.064	No	Birtley Supatherm
Independently assessed	E3 Sill	5.79	0.021	No	Knauf P5
Independently assessed	E4 Jamb	20.10	0.016	No	Knauf P6
Table K1 - Approved	E5 Ground floor (normal)	16.82	0.160	No	
Independently assessed	E6 Intermediate floor within a dwelling	16.82	0.000	No	CD0029
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	8.99	0.060	No	
Independently assessed	E12 Gable (insulation at ceiling level)	15.87	0.044	No	Knauf P21
Independently assessed	E16 Corner (normal)	10.60	0.039	No	Knauf P23
Table K1 - Approved	E18 Party wall between dwellings	8.80	0.060	No	
Table K1 - Default	P6 Party wall - Ground floor (inverted)	7.93	0.070	No	
Table K1 - Default	P2 Party wall - Intermediate floor within a dwelling	7.93	0.000	No	

Y-value W/m²K

18.0 Pressure Testing

Designed AP₅₀ m³/(h.m²) @ 50 Pa

Property Tested ?

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

As Built AP₅₀

m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather	<input type="text" value="Windows half open"/>
Cross ventilation possible	<input type="text" value="Yes"/>
Night Ventilation	<input type="text" value="Yes"/>
Air change rate	<input type="text" value="4.00"/>

Mechanical Ventilation

Mechanical Ventilation System Present	<input type="text" value="No"/>
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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	<input type="text" value="16"/>
Total number of L.E.L. fittings	<input type="text" value="16"/>
Percentage of L.E.L. fittings	<input type="text" value="100.00"/> %

External

External lights fitted	<input type="text" value="Yes"/>
Light and motion sensor	<input type="text" value="Yes"/>

23.0 Electricity Tariff

24.0 Main Heating 1

Description	<input type="text" value="Database"/>
Percentage of Heat	<input type="text" value="100"/> %
Database Ref. No.	<input type="text" value="17513"/>
Fuel Type	<input type="text" value="Mains gas"/>
Main Heating	<input type="text" value="BGW"/>
SAP Code	<input type="text" value="104"/>
In Winter	<input type="text" value="90.7"/>
In Summer	<input type="text" value="87.2"/>
Controls	<input type="text" value="CBE Programmer, room thermostat and TRVs"/>
PCDF Controls	<input type="text" value="0"/>
Delayed Start Stat	<input type="text" value="No"/>
Sap Code	<input type="text" value="2106"/>
Flue Type	<input type="text" value="Balanced"/>
Fan Assisted Flue	<input type="text" value="Yes"/>
Is MHS Pumped	<input type="text" value="Pump in heated space"/>
Heat Emitter	<input type="text" value="Radiators"/>
Flow Temperature	<input type="text" value="Normal (> 45°C)"/>
Combi boiler type	<input type="text" value="Standard Combi"/>
Combi keep hot type	<input type="text" value="Gas/Oil, time clock"/>

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

25.0 Main Heating 2

Community Heating

28.0 Water Heating

Water Heating

Flue Gas Heat Recovery System

Waste Water Heat Recovery Instantaneous System 1

Waste Water Heat Recovery Instantaneous System 2

Waste Water Heat Recovery Storage System

Solar Panel

Water use <= 125 litres/person/day

SAP Code

29.0 Hot Water Cylinder

32.0 Photovoltaic Unit

PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
0.75	West	30°	None Or Little	Yes

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

	Typical Cost	Typical savings per year	Ratings after improvement	
			SAP rating	Environmental Impact
Solar water heating	£4,000 - £6,000	£77	B 88	