



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 2 Oram Way
WEST END, SO30 3JW

Contact: Tobias Whiting
Abacus Energy (UK) Ltd
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Report Issue Date: 15/02/2022

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0647 Plot 2				Issued on Date	15/02/2022
Assessment Reference	As Built	Prop Type Ref	D (HA/AR)			
Property	2 Oram Way, WEST END, SO30 3JW					
SAP Rating	86 B	DER	15.11	TER	19.74	
Environmental	89 B	% DER<TER	23.45			
CO ₂ Emissions (t/year)	0.79	DFEE	46.95	TFEE	55.82	
General Requirements Compliance	Pass	% DFEE<TFEE	15.90			
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.com				Assessor ID	E477-0001
Client	Foreman Homes, FORE					

SUMMARY FOR INPUT DATA FOR New Build (As Built)

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)	19.74	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	15.11	kgCO ₂ /m ²	Pass
	-4.63 (-23.5%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	55.82	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	46.95	kWh/m ² /yr	
	-8.9 (-15.9%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	Pass
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	1.19 (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	4.27 (measured in this dwelling)	m ³ /(h.m ²) @ 50 Pa	
Maximum	10.0	m ³ /(h.m ²) @ 50 Pa	Pass

Limiting System Efficiencies

4 Heating efficiency

This report has 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 Built)

Main heating system

Boiler system with radiators or underfloor - Mains gas
Data from database
Worcester Greenstar 30Si 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

Continuous extract system

Specific fan power

0.30

Maximum

0.7

Pass

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Southern England)

Slight

Pass

Based on:

Overshading

Average

Windows facing North

7.49 m², No overhang

Windows facing East

1.32 m², No overhang

Windows facing South

3.43 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

4.27 (measured in this dwelling) m³/(h.m²) @ 50 Pa

Maximum

10.0 m³/(h.m²) @ 50 Pa

Pass

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BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

10 Key features

Party wall U-value	0.00	W/m ² K
Roof U-value	0.10	W/m ² K
Floor U-value	0.12	W/m ² K
Door U-value	1.10	W/m ² K
Photovoltaic array	0.62	kW

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THERMAL BRIDGING

Calculation Type: New Build (As Built)

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SAP Rating	86 B	DER	15.11	TER	19.74
Environmental	89 B	% DER<TER	23.45		
CO ₂ Emissions (t/year)	0.79	DFEE	46.95	TFEE	55.82
General Requirements Compliance	Pass	% DFEE<TFEE	15.90		

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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	0.098	1.26	0.12	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.053	3.76	0.20	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.043	3.60	0.15	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.060	1.51	0.09	Birtley Supatherm
External wall	E3 Sill	Independently assessed	0.034	7.61	0.26	CD0027
External wall	E4 Jamb	Independently assessed	0.039	27.30	1.06	CD0028
External wall	E5 Ground floor (normal)	Table K1 - Approved	0.160	16.79	2.69	
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.000	16.79	0.00	CD0029
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	16.79	1.01	
External wall	E16 Corner (normal)	Independently assessed	0.050	10.10	0.51	CD0035
External wall	E18 Party wall between dwellings	Table K1 - Approved	0.060	10.10	0.61	
Party wall	P1 Party wall - Ground floor	Table K1 - Default	0.160	8.50	1.36	
Party wall	P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	0.000	8.50	0.00	
Party wall	P4 Party wall - Roof (insulation at ceiling level)	Independently assessed	0.049	8.50	0.42	CD0020

Total: **8.47** W/mK:
Y-Value: **0.055** W/m²K:

FULL SAP CALCULATION PRINTOUT

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FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

DWELLING AS BUILT

Semi-Detached House, total floor area 70 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) 19.74 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 15.11 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)55.8 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)46.9 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (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	1.19 (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: 4.27 (measured in this dwelling)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas

Data from database

Worcester Greenstar 30Si 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

Continuous extract system

Specific fan power: 0.30
Maximum 0.7 OK

9 Summertime temperature

Overheating risk (Southern England): Slight OK

Based on:

Overshading: Average

Windows facing North: 7.49 m², No overhang

Windows facing East: 1.32 m², No overhang

Windows facing South: 3.43 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

Photovoltaic array 0.62 kW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	35.1100 (1b)	x 2.3900 (2b)	= 83.9129 (1b) - (3b)
First floor	35.1100 (1c)	x 2.6700 (2c)	= 93.7437 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.2200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 177.6566 (5)

2. Ventilation rate

										main	secondary	other	total	m3 per hour			
										heating	heating						
Number of chimneys										0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues										0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans																0 * 10 =	0.0000 (7a)
Number of passive vents																0 * 10 =	0.0000 (7b)
Number of flueless gas fires																0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans										= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) =		0.0000 (8)	
Pressure test														Yes			
Measured/design AP50																4.2700	
Infiltration rate																0.2135 (18)	
Number of sides sheltered																1 (19)	
Shelter factor										(20) = 1 - [0.075 x (19)] =						0.9250 (20)	
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =						0.1975 (21)	
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec					
	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																	
	0.2518	0.2469	0.2419	0.2172	0.2123	0.1876	0.1876	0.1827	0.1975	0.2123	0.2222	0.2320 (22b)					
Mechanical extract ventilation - centralised																	
If mechanical ventilation:																0.5000 (23a)	
Effective ac	0.5018	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)					

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			12.2400	1.1450	14.0153		(27)
Ground Floor			35.1100	0.1200	4.2132	84.0000	2949.2400 (28a)
Brick and Block	84.9600	14.3600	70.6000	0.2400	16.9440	42.2200	2980.7320 (29a)
Pitched Roof	35.1100		35.1100	0.1000	3.5110	9.1000	319.5010 (30)
Total net area of external elements Aum(A, m ²)			155.1800				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	41.0155			(33)
Party Wall 1			42.9400	0.0000	0.0000	70.0000	3005.8000 (32)
GF Stud			60.0000			9.0000	540.0000 (32c)
First Floor			75.1900			9.0000	676.7100 (32c)
Internal Floor 1			35.1100			18.0000	631.9800 (32d)
Internal Ceiling 1			35.1100			18.0000	631.9800 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	11735.9430 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							167.1311 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.4729 (36)
Total fabric heat loss						(33) + (36) =	49.4884 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	29.4187	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133 (38)
Heat transfer coeff	78.9070	78.8017	78.8017	78.8017	78.8017	78.8017	78.8017	78.8017	78.8017	78.8017	78.8017	78.8017 (39)
Average = Sum(39)m / 12 =												78.8105 (39)
HLP	1.1237	1.1222	1.1222	1.1222	1.1222	1.1222	1.1222	1.1222	1.1222	1.1222	1.1222	1.1222 (40)
HLP (average)												1.1223 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2515 (42)
Average daily hot water use (litres/day)	87.6720 (43)

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

Energy conte	96.4392	92.9324	89.4255	85.9186	82.4117	78.9048	78.9048	82.4117	85.9186	89.4255	92.9324	96.4392	(44)
Energy content (annual)	143.0166	125.0832	129.0747	112.5304	107.9756	93.1748	86.3401	99.0766	100.2598	116.8432	127.5435	138.5039	(45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1379.4225	(45)
21.4525	18.7625	19.3612	16.8796	16.1963	13.9762	12.9510	14.8615	15.0390	17.5265	19.1315	20.7756	(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	31.2121	28.1758	31.1694	30.1354	31.1192	30.0914	31.0795	31.1052	30.1154	31.1486	30.1769	31.2039	(61)
Total heat required for water heating calculated for each month													
174.2288	153.2590	160.2441	142.6658	139.0948	123.2662	117.4197	130.1818	130.3752	147.9918	157.7204	169.7078	(62)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
								Solar input (sum of months) = Sum(63)m =				0.0000	(63)
Output from w/h													
174.2288	153.2590	160.2441	142.6658	139.0948	123.2662	117.4197	130.1818	130.3752	147.9918	157.7204	169.7078	(64)	
								Total per year (kWh/year) = Sum(64)m =				1746.1553	(64)
Heat gains from water heating, kWh/month													
55.3561	48.6341	50.7097	44.9502	43.6817	38.5035	36.4780	40.7193	40.8652	46.6375	49.9524	53.8535	(65)	

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	112.5727	112.5727	112.5727	112.5727	112.5727	112.5727	112.5727	112.5727	112.5727	112.5727	112.5727	112.5727 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.1079	16.0832	13.0798	9.9022	7.4020	6.2491	6.7524	8.7770	11.7805	14.9580	17.4582	18.6111 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	197.8100	199.8626	194.6900	183.6782	169.7776	156.7131	147.9852	145.9326	151.1052	162.1171	176.0176	189.0821 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2573	34.2573	34.2573	34.2573	34.2573	34.2573	34.2573	34.2573	34.2573	34.2573	34.2573	34.2573 (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)	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582 (71)
Water heating gains (Table 5)	74.4033	72.3722	68.1582	62.4309	58.7120	53.4770	49.0295	54.7302	56.7573	62.6848	69.3784	72.3838 (72)
Total internal gains	350.0930	348.0899	335.6998	315.7831	295.6634	276.2111	263.5390	269.2116	279.4147	299.5317	322.6260	339.8488 (73)

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

North	7.4900	10.6334	0.6300	0.7000	0.7700	24.3403 (74)
East	1.3200	19.6403	0.6300	0.7000	0.7700	7.9231 (76)
South	3.4300	46.7521	0.6300	0.7000	0.7700	49.0080 (78)

7. Mean internal temperature (heating season)												
Temperature during heating periods in the living area from Table 9, Th1 (C)												
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	41.3142	41.3695	41.3695	41.3695	41.3695	41.3695	41.3695	41.3695	41.3695	41.3695	41.3695	41.3695
alpha	3.7543	3.7580	3.7580	3.7580	3.7580	3.7580	3.7580	3.7580	3.7580	3.7580	3.7580	3.7580
util living area	0.9898	0.9826	0.9671	0.9283	0.8436	0.7004	0.5503	0.6022	0.8137	0.9465	0.9829	0.9916 (86)
MIT	19.3750	19.5640	19.8723	20.2689	20.6367	20.8745	20.9619	20.9462	20.7664	20.2988	19.7556	19.3242 (87)
Th 2	19.9815	19.9827	19.9827	19.9827	19.9827	19.9827	19.9827	19.9827	19.9827	19.9827	19.9827	19.9827 (88)
util rest of house	0.9875	0.9786	0.9592	0.9100	0.8019	0.6206	0.4375	0.4897	0.7498	0.9291	0.9783	0.9897 (89)
MIT 2	18.5013	18.6895	18.9935	19.3779	19.7176	19.9130	19.9691	19.9617	19.8359	19.4132	18.8811	18.4518 (90)
Living area fraction									fLA = Living area / (4) =			0.2224 (91)
MIT	18.6956	18.8840	19.1889	19.5761	19.9220	20.1269	20.1900	20.1807	20.0429	19.6102	19.0756	18.6458 (92)
Temperature adjustment												0.0000
adjusted MIT	18.6956	18.8840	19.1889	19.5761	19.9220	20.1269	20.1900	20.1807	20.0429	19.6102	19.0756	18.6458 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9835	0.9730	0.9514	0.9012	0.7991	0.6329	0.4617	0.5131	0.7541	0.9211	0.9728	0.9862 (94)
Useful gains	424.2341	477.1034	516.1345	536.6596	505.6038	393.6074	273.4098	283.7299	385.3137	423.6016	409.1892	403.3651 (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	1135.9178	1101.9643	999.9108	841.2957	647.9096	435.5290	282.8944	297.9259	468.3093	710.0177	943.6987	1138.3573 (97)
Month fracti	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												
	529.4926	419.9065	359.9296	219.3381	105.8755	0.0000	0.0000	0.0000	0.0000	213.0936	384.8468	546.8342 (98)
Space heating												2779.3169 (98)
Space heating per m2												39.5801 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)											
Fraction of space heat from main system(s)	1.0000 (202)											
Efficiency of main space heating system 1 (in %)	90.7000 (206)											
Efficiency of secondary/supplementary heating system, %	0.0000 (208)											
Space heating requirement	3064.2965 (211)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	529.4926	419.9065	359.9296	219.3381	105.8755	0.0000	0.0000	0.0000	0.0000	213.0936	384.8468	546.8342 (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)	583.7846	462.9620	396.8352	241.8281	116.7315	0.0000	0.0000	0.0000	0.0000	234.9433	424.3074	602.9044 (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	174.2288	153.2590	160.2441	142.6658	139.0948	123.2662	117.4197	130.1818	130.3752	147.9918	157.7204	169.7078 (64)
Efficiency of water heater (217)m	89.7549	89.6802	89.5271	89.2049	88.5614	87.0000	87.0000	87.0000	87.0000	89.1461	89.5924	87.0000 (216)
Fuel for water heating, kWh/month	194.1161	170.8951	178.9895	159.9306	157.0603	141.6852	134.9651	149.6342	149.8566	166.0103	176.0422	188.9936 (219)
Water heating fuel used												1968.1788 (219)
Annual totals kWh/year												
Space heating fuel - main system												3064.2965 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.4200)												
mechanical ventilation fans (SFP = 0.4200)												91.0312 (230a)
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												166.0312 (231)
Electricity for lighting (calculated in Appendix L)												319.7904 (232)
Energy saving/generation technologies (Appendices M, N and Q)												
PV Unit 0 (0.80 * 0.62 * 1080 * 1.00) =												-535.4442 (233)
Total delivered energy for all uses												4982.8527 (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	3064.2965	0.2160	661.8880 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1968.1788	0.2160	425.1266 (264)
Space and water heating			1087.0147 (265)
Pumps and fans	166.0312	0.5190	86.1702 (267)
Energy for lighting	319.7904	0.5190	165.9712 (268)
Energy saving/generation technologies			
PV Unit	-535.4442	0.5190	-277.8955 (269)
Total CO2, kg/year			1061.2606 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			15.1100 (273)

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

DER	15.1100	ZC1
Total Floor Area	70.2200	
Assumed number of occupants	2.2515	
CO2 emission factor in Table 12 for electricity displaced from grid	0.5190	
CO2 emissions from appliances, equation (L14)	16.6930	ZC2
CO2 emissions from cooking, equation (L16)	2.4642	ZC3
Total CO2 emissions	34.2672	ZC4
Residual CO2 emissions offset from biofuel CHP	0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year	0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation	0.0000	ZC7
Net CO2 emissions	34.2672	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (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	35.1100 (1b)	x 2.3900 (2b)	= 83.9129 (1b) - (3b)
First floor	35.1100 (1c)	x 2.6700 (2c)	= 93.7437 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.2200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 177.6566 (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) = 0.1689 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4189 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3875 (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	0.4940	0.4843	0.4746	0.4262	0.4165	0.3681	0.3681	0.3584	0.3875	0.4165	0.4359	0.4553 (22b)
Effective ac	0.6220	0.6173	0.6126	0.5908	0.5867	0.5677	0.5677	0.5642	0.5751	0.5867	0.5950	0.6036 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			2.1200	1.0000	2.1200		(26)					
TER Opening Type (Uw = 1.40)			12.2400	1.3258	16.2273		(27)					
Ground Floor			35.1100	0.1300	4.5643		(28a)					
Brick and Block	84.9600	14.3600	70.6000	0.1800	12.7080		(29a)					
Pitched Roof	35.1100		35.1100	0.1300	4.5643		(30)					
Total net area of external elements Aum(A, m2)			155.1800				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	40.1839		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.1608 (36)					
Total fabric heat loss						(33) + (36) =	49.3447 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 36.4668	Feb 36.1890	Mar 35.9168	Apr 34.6379	May 34.3986	Jun 33.2847	Jul 33.2847	Aug 33.0785	Sep 33.7138	Oct 34.3986	Nov 34.8827	Dec 35.3887 (38)
Heat transfer coeff	85.8115	85.5337	85.2614	83.9826	83.7433	82.6294	82.6294	82.4231	83.0585	83.7433	84.2273	84.7334 (39)
Average = Sum(39)m / 12 =												83.9814 (39)
HLP	Jan 1.2220	Feb 1.2181	Mar 1.2142	Apr 1.1960	May 1.1926	Jun 1.1767	Jul 1.1767	Aug 1.1738	Sep 1.1828	Oct 1.1926	Nov 1.1995	Dec 1.2067 (40)
HLP (average)												1.1960 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2515 (42)
Average daily hot water use (litres/day)												87.6720 (43)
Daily hot water use	96.4392	92.9324	89.4255	85.9186	82.4117	78.9048	78.9048	82.4117	85.9186	89.4255	92.9324	96.4392 (44)
Energy conte	143.0166	125.0832	129.0747	112.5304	107.9756	93.1748	86.3401	99.0766	100.2598	116.8432	127.5435	138.5039 (45)
Energy content (annual)										Total = Sum(45)m =		1379.4225 (45)
Distribution loss (46)m = 0.15 x (45)m	21.4525	18.7625	19.3612	16.8796	16.1963	13.9762	12.9510	14.8615	15.0390	17.5265	19.1315	20.7756 (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												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Total heat required for water heating calculated for each month	49.1444	42.7743	45.5702	42.3708	41.9961	38.9120	40.2090	41.9961	42.3708	45.5702	45.8297	49.1444 (61)
Solar input	192.1610	167.8576	174.6449	154.9013	149.9718	132.0867	126.5492	141.0727	142.6307	162.4134	173.3731	187.6483 (62)
Output from w/h	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)
Heat gains from water heating, kWh/month	192.1610	167.8576	174.6449	154.9013	149.9718	132.0867	126.5492	141.0727	142.6307	162.4134	173.3731	187.6483 (64)
	59.8391	52.2838	54.3099	48.0091	46.4009	40.7086	38.7604	43.4420	43.9291	50.2429	53.8656	58.3387 (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	112.5727	112.5727	112.5727	112.5727	112.5727	112.5727	112.5727	112.5727	112.5727	112.5727	112.5727	112.5727	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.1079	16.0832	13.0798	9.9022	7.4020	6.2491	6.7524	8.7770	11.7805	14.9580	17.4582	18.6111	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	197.8100	199.8626	194.6900	183.6782	169.7776	156.7131	147.9852	145.9326	151.1052	162.1171	176.0176	189.0821	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2573	34.2573	34.2573	34.2573	34.2573	34.2573	34.2573	34.2573	34.2573	34.2573	34.2573	34.2573	(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)	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	(71)
Water heating gains (Table 5)	80.4289	77.8032	72.9972	66.6793	62.3668	56.5397	52.0972	58.3898	61.0126	67.5308	74.8134	78.4122	(72)
Total internal gains	356.1186	353.5209	340.5388	320.0315	299.3183	279.2738	266.6067	272.8711	283.6701	304.3777	328.0609	345.8772	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North				7.4900	10.6334	0.6300	0.7000	0.7700	24.3403 (74)			
East				1.3200	19.6403	0.6300	0.7000	0.7700	7.9231 (76)			
South				3.4300	46.7521	0.6300	0.7000	0.7700	49.0080 (78)			
Solar gains	81.2713	142.2771	206.8063	279.7406	337.0639	345.6748	328.6246	283.7664	231.5216	160.3323	97.9972	69.1542 (83)
Total gains	437.3899	495.7980	547.3451	599.7721	636.3822	624.9485	595.2313	556.6375	515.1917	464.7100	426.0581	415.0314 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	56.8268	57.0113	57.1934	58.0643	58.2302	59.0152	59.0152	59.1629	58.7103	58.2302	57.8956	57.5498	
alpha	4.7885	4.8008	4.8129	4.8710	4.8820	4.9343	4.9343	4.9442	4.9140	4.8820	4.8597	4.8367	
util living area	0.9976	0.9952	0.9889	0.9671	0.9019	0.7554	0.5887	0.6449	0.8719	0.9777	0.9953	0.9982	(86)
MIT	19.6842	19.8326	20.0812	20.4215	20.7281	20.9245	20.9825	20.9731	20.8353	20.4471	20.0102	19.6640	(87)
Th 2	19.9024	19.9056	19.9087	19.9232	19.9259	19.9387	19.9387	19.9410	19.9338	19.9259	19.9204	19.9147	(88)
util rest of house	0.9968	0.9936	0.9847	0.9539	0.8611	0.6633	0.4578	0.5139	0.8045	0.9663	0.9934	0.9975	(89)
MIT 2	18.1567	18.3753	18.7387	19.2362	19.6521	19.8867	19.9321	19.9297	19.7973	19.2807	18.6457	18.1357	(90)
Living area fraction	18.4965	18.6995	19.0373	19.4999	19.8915	20.1176	20.1658	20.1618	20.0282	19.5402	18.9492	18.4756	(91)
MIT	18.4965	18.6995	19.0373	19.4999	19.8915	20.1176	20.1658	20.1618	20.0282	19.5402	18.9492	18.4756	(92)
Temperature adjustment	18.4965	18.6995	19.0373	19.4999	19.8915	20.1176	20.1658	20.1618	20.0282	19.5402	18.9492	18.4756	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	435.3069	491.2991	536.4677	568.0651	547.0078	425.1696	289.9342	302.2056	418.1088	446.4236	422.1302	413.4845	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1218.2214	1180.3219	1068.9484	890.2045	685.9796	455.9149	294.6373	310.0575	492.3841	748.6795	998.0297	1209.6214	(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	582.4884	463.0234	396.1656	231.9404	103.3950	0.0000	0.0000	0.0000	0.0000	224.8784	414.6477	592.3258	(98)
Space heating												3008.8646	(98)
Space heating per m2												42.8491	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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													3221.4824 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	582.4884	463.0234	396.1656	231.9404	103.3950	0.0000	0.0000	0.0000	0.0000	224.8784	414.6477	592.3258	(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)	623.6492	495.7424	424.1602	248.3302	110.7013	0.0000	0.0000	0.0000	0.0000	240.7692	443.9482	634.1818	(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	192.1610	167.8576	174.6449	154.9013	149.9718	132.0867	126.5492	141.0727	142.6307	162.4134	173.3731	187.6483	(64)
Efficiency of water heater (217)m	87.6648	87.4727	87.0500	86.0653	84.1361	80.3000	80.3000	80.3000	80.3000	85.8707	87.1674	80.3000	(216)
Fuel for water heating, kWh/month	219.1997	191.8972	200.6259	179.9810	178.2491	164.4916	157.5955	175.6820	177.6222	189.1373	198.8967	213.8568	(219)
Water heating fuel used												2247.2350	(219)
Annual totals kWh/year													
Space heating fuel - main system												3221.4824	(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)												319.7904	(232)
Total delivered energy for all uses												5863.5079	(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	3221.4824	0.2160	695.8402 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2247.2350	0.2160	485.4028 (264)
Space and water heating			1181.2430 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	319.7904	0.5190	165.9712 (268)
Total CO2, kg/m2/year			1386.1392 (272)
Emissions per m2 for space and water heating			16.8220 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3636 (272b)
Emissions per m2 for pumps and fans			0.5543 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.8220 * 1.00) + 2.3636 + 0.5543, rounded to 2 d.p.			19.7400 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	35.1100 (1b)	x 2.3900 (2b)	= 83.9129 (1b) - (3b)
First floor	35.1100 (1c)	x 2.6700 (2c)	= 93.7437 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.2200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 177.6566 (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) = 0.1689 (8)
Pressure test					Yes
Measured/design AP50					4.2700
Infiltration rate					0.3824 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3537 (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	0.4510	0.4421	0.4333	0.3891	0.3802	0.3360	0.3360	0.3272	0.3537	0.3802	0.3979	0.4156 (22b)
Effective ac	0.6017	0.5977	0.5939	0.5757	0.5723	0.5564	0.5564	0.5535	0.5625	0.5723	0.5792	0.5864 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			12.2400	1.1450	14.0153		(27)
Ground Floor			35.1100	0.1200	4.2132	84.0000	2949.2400 (28a)
Brick and Block	84.9600	14.3600	70.6000	0.2400	16.9440	42.2200	2980.7320 (29a)
Pitched Roof	35.1100		35.1100	0.1000	3.5110	9.1000	319.5010 (30)
Total net area of external elements Aum(A, m ²)			155.1800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.0155		(33)
Party Wall 1			42.9400	0.0000	0.0000	70.0000	3005.8000 (32)
GF Stud			60.0000			9.0000	540.0000 (32c)
First Floor			75.1900			9.0000	676.7100 (32c)
Internal Floor 1			35.1100			18.0000	631.9800 (32d)
Internal Ceiling 1			35.1100			9.0000	315.9900 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss
(28)...(30) + (32) + (32a)...(32e) = 11419.9530 (34)
162.6311 (35)
8.4729 (36)
(33) + (36) = 49.4884 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	35.2744	35.0430	34.8161	33.7504	33.5510	32.6228	32.6228	32.4509	32.9803	33.5510	33.9543	34.3760 (38)
Heat transfer coeff	84.7628	84.5313	84.3044	83.2387	83.0393	82.1111	82.1111	81.9392	82.4687	83.0393	83.4427	83.8644 (39)
Average = Sum(39)m / 12 =												83.2378 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2071	1.2038	1.2006	1.1854	1.1826	1.1693	1.1693	1.1669	1.1744	1.1826	1.1883	1.1943 (40)
HLP (average)												1.1854 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2515 (42)
Average daily hot water use (litres/day)												87.6720 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.4392	92.9324	89.4255	85.9186	82.4117	78.9048	78.9048	82.4117	85.9186	89.4255	92.9324	96.4392 (44)
Energy conte	143.0166	125.0832	129.0747	112.5304	107.9756	93.1748	86.3401	99.0766	100.2598	116.8432	127.5435	138.5039 (45)
Energy content (annual)										Total = Sum(45)m =		1379.4225 (45)

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Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	30.3910	26.5802	27.4284	23.9127	22.9448	19.7996	18.3473	21.0538	21.3052	24.8292	27.1030	29.4321 (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	112.5727	112.5727	112.5727	112.5727	112.5727	112.5727	112.5727	112.5727	112.5727	112.5727	112.5727	112.5727	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.1079	16.0832	13.0798	9.9022	7.4020	6.2491	6.7524	8.7770	11.7805	14.9580	17.4582	18.6111	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	197.8100	199.8626	194.6900	183.6782	169.7776	156.7131	147.9852	145.9326	151.1052	162.1171	176.0176	189.0821	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2573	34.2573	34.2573	34.2573	34.2573	34.2573	34.2573	34.2573	34.2573	34.2573	34.2573	34.2573	(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)	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	(71)
Water heating gains (Table 5)	40.8482	39.5539	36.8661	33.2121	30.8398	27.4995	24.6603	28.2981	29.5906	33.3725	37.6430	39.5593	(72)
Total internal gains	313.5378	312.2715	301.4077	283.5643	264.7913	247.2335	236.1697	239.7795	249.2480	267.2194	287.8906	304.0243	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	7.4900	10.6334	0.6300	0.7000	0.7700	24.3403 (74)
East	1.3200	19.6403	0.6300	0.7000	0.7700	7.9231 (76)
South	3.4300	46.7521	0.6300	0.7000	0.7700	49.0080 (78)

Solar gains	81.2713	142.2771	206.8063	279.7406	337.0639	345.6748	328.6246	283.7664	231.5216	160.3323	97.9972	69.1542	(83)
Total gains	394.8091	454.5487	508.2140	563.3049	601.8552	592.9083	564.7943	523.5459	480.7696	427.5517	385.8878	373.1785	(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	37.4245	37.5270	37.6280	38.1098	38.2013	38.6331	38.6331	38.7142	38.4656	38.2013	38.0166	37.8255	
alpha	3.4950	3.5018	3.5085	3.5407	3.5468	3.5755	3.5755	3.5809	3.5644	3.5468	3.5344	3.5217	
util living area	0.9917	0.9856	0.9726	0.9394	0.8656	0.7321	0.5861	0.6400	0.8415	0.9565	0.9863	0.9932	(86)
MIT	19.1344	19.3354	19.6713	20.1244	20.5394	20.8318	20.9443	20.9230	20.6979	20.1666	19.5737	19.1024	(87)
Th 2	19.9143	19.9170	19.9195	19.9317	19.9340	19.9446	19.9446	19.9466	19.9405	19.9340	19.9294	19.9246	(88)
util rest of house	0.9897	0.9822	0.9658	0.9231	0.8269	0.6524	0.4666	0.5229	0.7816	0.9417	0.9825	0.9916	(89)
MIT 2	18.2150	18.4165	18.7508	19.2022	19.5929	19.8489	19.9242	19.9156	19.7460	19.2513	18.6639	18.1907	(90)
Living area fraction	18.4195	18.6209	18.9556	19.4073	19.8035	20.0676	20.1511	20.1397	19.9578	19.4549	18.8662	18.3935	(91)
Temperature adjustment	18.4195	18.6209	18.9556	19.4073	19.8035	20.0676	20.1511	20.1397	19.9578	19.4549	18.8662	18.3935	(92)
adjusted MIT	18.4195	18.6209	18.9556	19.4073	19.8035	20.0676	20.1511	20.1397	19.9578	19.4549	18.8662	18.3935	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9860	0.9768	0.9580	0.9133	0.8214	0.6627	0.4916	0.5463	0.7828	0.9331	0.9773	0.9884	(94)
Ext temp.	389.2857	443.9950	486.8477	514.4508	494.3507	392.9361	277.6408	286.0055	376.3384	398.9686	377.1276	368.8454	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Month fracti	1196.8087	1159.8445	1050.0602	874.6167	672.9054	448.9489	291.5836	306.4266	483.0839	735.3050	981.8066	1190.3276	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating per m2	600.7971	481.0508	419.0300	259.3194	132.8446	0.0000	0.0000	0.0000	0.0000	250.2343	435.3689	611.1827	(98)
												3189.8279	(98)
												45.4262	(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	771.8446	607.6224	622.7382	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7840	0.8522	0.8227	0.0000	0.0000	0.0000	0.0000	(101)

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Calculation Type: New Build (As Built)

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Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	605.0982	517.7999	512.3307	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	776.8471	742.3107	695.5147	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	123.6592	167.0360	136.2888	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												426.9841 (104)
Cooled fraction									FC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	30.9148	41.7590	34.0722	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												106.7460 (107)
Space cooling per m2												1.5202 (108)
Energy for space heating												45.4262 (99)
Energy for space cooling												1.5202 (108)
Total												46.9464 (109)
Dwelling Fabric Energy Efficiency (DFEE)												46.9 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (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	35.1100 (1b)	x 2.3900 (2b)	= 83.9129 (1b) - (3b)
First floor	35.1100 (1c)	x 2.6700 (2c)	= 93.7437 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.2200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 177.6566 (5)

2. Ventilation rate

										main	secondary	other	total	m3 per hour			
										heating	heating						
Number of chimneys										0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues										0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans																3 * 10 =	30.0000 (7a)
Number of passive vents																0 * 10 =	0.0000 (7b)
Number of flueless gas fires																0 * 40 =	0.0000 (7c)
										Air changes per hour							
Infiltration due to chimneys, flues and fans										= (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) =	0.1689 (8)	
Pressure test										Yes							
Measured/design AP50										5.0000							
Infiltration rate										0.4189 (18)							
Number of sides sheltered										1 (19)							
Shelter factor										(20) = 1 - [0.075 x (19)] =					0.9250 (20)		
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =					0.3875 (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	0.4940	0.4843	0.4746	0.4262	0.4165	0.3681	0.3681	0.3584	0.3875	0.4165	0.4359	0.4553 (22b)					
Effective ac	0.6220	0.6173	0.6126	0.5908	0.5867	0.5677	0.5677	0.5642	0.5751	0.5867	0.5950	0.6036 (25)					

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			2.1200	1.0000	2.1200		(26)					
TER Opening Type (Uw = 1.40)			12.2400	1.3258	16.2273		(27)					
Ground Floor			35.1100	0.1300	4.5643		(28a)					
Brick and Block	84.9600	14.3600	70.6000	0.1800	12.7080		(29a)					
Pitched Roof	35.1100		35.1100	0.1300	4.5643		(30)					
Total net area of external elements Aum(A, m2)			155.1800				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	40.1839		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.1608 (36)					
Total fabric heat loss						(33) + (36) =	49.3447 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 36.4668	Feb 36.1890	Mar 35.9168	Apr 34.6379	May 34.3986	Jun 33.2847	Jul 33.2847	Aug 33.0785	Sep 33.7138	Oct 34.3986	Nov 34.8827	Dec 35.3887 (38)
Heat transfer coeff	85.8115	85.5337	85.2614	83.9826	83.7433	82.6294	82.6294	82.4231	83.0585	83.7433	84.2273	84.7334 (39)
Average = Sum(39)m / 12 =												83.9814 (39)
HLP	Jan 1.2220	Feb 1.2181	Mar 1.2142	Apr 1.1960	May 1.1926	Jun 1.1767	Jul 1.1767	Aug 1.1738	Sep 1.1828	Oct 1.1926	Nov 1.1995	Dec 1.2067 (40)
HLP (average)												1.1960 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2515 (42)
Average daily hot water use (litres/day)												87.6720 (43)
Daily hot water use	Jan 96.4392	Feb 92.9324	Mar 89.4255	Apr 85.9186	May 82.4117	Jun 78.9048	Jul 78.9048	Aug 82.4117	Sep 85.9186	Oct 89.4255	Nov 92.9324	Dec 96.4392 (44)
Energy conte	143.0166	125.0832	129.0747	112.5304	107.9756	93.1748	86.3401	99.0766	100.2598	116.8432	127.5435	138.5039 (45)
Energy content (annual)												Total = Sum(45)m = 1379.4225 (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	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Heat gains from water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
	30.3910	26.5802	27.4284	23.9127	22.9448	19.7996	18.3473	21.0538	21.3052	24.8292	27.1030	29.4321 (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 (66)
	112.5727	112.5727	112.5727	112.5727	112.5727	112.5727	112.5727	112.5727	112.5727	112.5727	112.5727	112.5727 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	18.1079	16.0832	13.0798	9.9022	7.4020	6.2491	6.7524	8.7770	11.7805	14.9580	17.4582	18.6111 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	197.8100	199.8626	194.6900	183.6782	169.7776	156.7131	147.9852	145.9326	151.1052	162.1171	176.0176	189.0821 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	34.2573	34.2573	34.2573	34.2573	34.2573	34.2573	34.2573	34.2573	34.2573	34.2573	34.2573	34.2573 (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)												
	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582 (71)
Water heating gains (Table 5)												
	40.8482	39.5539	36.8661	33.2121	30.8398	27.4995	24.6603	28.2981	29.5906	33.3725	37.6430	39.5593 (72)
Total internal gains	313.5378	312.2715	301.4077	283.5643	264.7913	247.2335	236.1697	239.7795	249.2480	267.2194	287.8906	304.0243 (73)

6. Solar gains												

[Jan]												
	Area											
	m2											
	Solar flux											
	Table 6a											
	W/m2											
	Specific data											
	or Table 6b											
	Specific data											
	or Table 6c											
	Access											
	factor											
	Table 6d											
	Gains											
	W											
North	7.4900											24.3403 (74)
East	1.3200											7.9231 (76)
South	3.4300											49.0080 (78)

Solar gains	81.2713	142.2771	206.8063	279.7406	337.0639	345.6748	328.6246	283.7664	231.5216	160.3323	97.9972	69.1542 (83)
Total gains	394.8091	454.5487	508.2140	563.3049	601.8552	592.9083	564.7943	523.5459	480.7696	427.5517	385.8878	373.1785 (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	56.8268	57.0113	57.1934	58.0643	58.2302	59.0152	59.0152	59.1629	58.7103	58.2302	57.8956	57.5498
alpha	4.7885	4.8008	4.8129	4.8710	4.8820	4.9343	4.9343	4.9442	4.9140	4.8820	4.8597	4.8367
util living area	0.9985	0.9967	0.9918	0.9740	0.9173	0.7807	0.6156	0.6767	0.8948	0.9840	0.9969	0.9989 (86)
MIT	19.6286	19.7793	20.0320	20.3799	20.6991	20.9122	20.9788	20.9669	20.8100	20.4025	19.9581	19.6090 (87)
Th 2	19.9024	19.9056	19.9087	19.9232	19.9259	19.9387	19.9387	19.9410	19.9338	19.9259	19.9204	19.9147 (88)
util rest of house	0.9980	0.9956	0.9887	0.9632	0.8808	0.6905	0.4811	0.5433	0.8341	0.9754	0.9957	0.9985 (89)
MIT 2	18.6551	18.8078	19.0615	19.4150	19.7152	19.8964	19.9331	19.9312	19.8227	19.4429	18.9984	18.6452 (90)
Living area fraction									fLA = Living area / (4) =			0.2224 (91)
MIT	18.8716	19.0239	19.2774	19.6296	19.9341	20.1224	20.1657	20.1615	20.0423	19.6564	19.2119	18.8596 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8716	19.0239	19.2774	19.6296	19.9341	20.1224	20.1657	20.1615	20.0423	19.6564	19.2119	18.8596 (93)

8. Space heating requirement												

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9973	0.9943	0.9862	0.9594	0.8811	0.7079	0.5114	0.5732	0.8416	0.9725	0.9945	0.9979 (94)
Useful gains	393.7258	451.9419	501.2221	540.4355	530.3102	419.6930	288.8296	300.1166	404.6304	415.7839	383.7511	372.4002 (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	1250.4127	1208.0709	1089.4202	901.1003	689.5497	456.3108	294.6341	310.0388	493.5621	758.4094	1020.1492	1242.1577 (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	637.3750	508.1187	437.6194	259.6787	118.4742	0.0000	0.0000	0.0000	0.0000	254.9134	458.2067	647.0996 (98)
Space heating												3321.4856 (98)
Space heating per m2										(98) / (4) =		47.3011 (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	776.7165	611.4577	626.4159	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8316	0.9010	0.8721	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	645.8858	550.8979	546.3128	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	776.8471	742.3107	695.5147	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	94.2921	142.4111	111.0062	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												347.7095 (104)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Cooled fraction											FC = cooled area / (4) =	1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	23.5730	35.6028	27.7515	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												86.9274 (107)
Space cooling per m2												1.2379 (108)
Energy for space heating												47.3011 (99)
Energy for space cooling												1.2379 (108)
Total												48.5391 (109)
Target Fabric Energy Efficiency (TFEE)												55.8 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	35.1100 (1b)	x 2.3900 (2b)	= 83.9129 (1b) - (3b)
First floor	35.1100 (1c)	x 2.6700 (2c)	= 93.7437 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.2200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 177.6566 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					4.2700
Infiltration rate					0.2135 (18)
Number of sides sheltered					1 (19)
Shelter factor			(20) = 1 - [0.075 x (19)]	=	0.9250 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20)	=	0.1975 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000 (22)
Wind factor	1.1750	1.1000	1.1000	1.0000	1.0250	0.9750	0.9750	0.9500	0.9500	1.0250	1.0000	1.0250 (22a)
Adj infilt rate	0.2320	0.2172	0.2172	0.1975	0.2024	0.1926	0.1926	0.1876	0.1876	0.2024	0.1975	0.2024 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			12.2400	1.1450	14.0153		(27)
Ground Floor			35.1100	0.1200	4.2132	84.0000	2949.2400 (28a)
Brick and Block	84.9600	14.3600	70.6000	0.2400	16.9440	42.2200	2980.7320 (29a)
Pitched Roof	35.1100		35.1100	0.1000	3.5110	9.1000	319.5010 (30)
Total net area of external elements Aum(A, m ²)			155.1800				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	41.0155			(33)
Party Wall 1			42.9400	0.0000	0.0000	70.0000	3005.8000 (32)
GF Stud			60.0000			9.0000	540.0000 (32c)
First Floor			75.1900			9.0000	676.7100 (32c)
Internal Floor 1			35.1100			18.0000	631.9800 (32d)
Internal Ceiling 1			35.1100			18.0000	631.9800 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	11735.9430 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							167.1311 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.4729 (36)
Total fabric heat loss						(33) + (36) =	49.4884 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 29.3133	Feb 29.3133	Mar 29.3133	Apr 29.3133	May 29.3133	Jun 29.3133	Jul 29.3133	Aug 29.3133	Sep 29.3133	Oct 29.3133	Nov 29.3133	Dec 29.3133 (38)
Heat transfer coeff	78.8017	78.8017	78.8017	78.8017	78.8017	78.8017	78.8017	78.8017	78.8017	78.8017	78.8017	78.8017 (39)
Average = Sum(39)m / 12 =												78.8017 (39)
HLP	Jan 1.1222	Feb 1.1222	Mar 1.1222	Apr 1.1222	May 1.1222	Jun 1.1222	Jul 1.1222	Aug 1.1222	Sep 1.1222	Oct 1.1222	Nov 1.1222	Dec 1.1222 (40)
HLP (average)												1.1222 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2515 (42)
Average daily hot water use (litres/day)												87.6720 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Energy conte	96.4392	92.9324	89.4255	85.9186	82.4117	78.9048	78.9048	82.4117	85.9186	89.4255	92.9324	96.4392 (44)
Energy content (annual)	143.0166	125.0832	129.0747	112.5304	107.9756	93.1748	86.3401	99.0766	100.2598	116.8432	127.5435	138.5039 (45)
Distribution loss (46)m = 0.15 x (45)m	21.4525	18.7625	19.3612	16.8796	16.1963	13.9762	12.9510	14.8615	15.0390	17.5265	19.1315	20.7756 (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	31.2121	28.1758	31.1694	30.1354	31.1192	30.0914	31.0795	31.1052	30.1154	31.1486	30.1769	31.2039 (61)
Total heat required for water heating calculated for each month	174.2288	153.2590	160.2441	142.6658	139.0948	123.2662	117.4197	130.1818	130.3752	147.9918	157.7204	169.7078 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	174.2288	153.2590	160.2441	142.6658	139.0948	123.2662	117.4197	130.1818	130.3752	147.9918	157.7204	169.7078 (64)
RHI water heating demand												
Heat gains from water heating, kWh/month	55.3561	48.6341	50.7097	44.9502	43.6817	38.5035	36.4780	40.7193	40.8652	46.6375	49.9524	53.8535 (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	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	45.2696	40.2081	32.6994	24.7556	18.5051	15.6228	16.8809	21.9425	29.4512	37.3950	43.6455	46.5278 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	295.2388	298.3024	290.5821	274.1465	253.3995	233.9002	220.8735	217.8098	225.5301	241.9658	262.7128	282.2121 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602 (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)	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582 (71)
Water heating gains (Table 5)	74.4033	72.3722	68.1582	62.4309	58.7120	53.4770	49.0295	54.7302	56.7573	62.6848	69.3784	72.3838 (72)
Total internal gains	513.7010	509.6720	490.2290	460.1222	429.4058	401.7892	385.5732	393.2718	410.5278	440.8349	474.5259	499.9129 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W		
North				7.4900	13.4684	0.6300	0.7000	0.7700		30.8298 (74)		
East				1.3200	25.1733	0.6300	0.7000	0.7700		10.1551 (76)		
South				3.4300	56.5862	0.6300	0.7000	0.7700		59.3166 (78)		
Solar gains	100.3015	150.0403	223.7650	306.5532	349.2470	396.8048	362.2780	325.3717	263.2108	182.9298	120.6667	80.7253 (83)
Total gains	614.0025	659.7123	713.9940	766.6754	778.6527	798.5940	747.8512	718.6435	673.7386	623.7647	595.1926	580.6383 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	41.3695	41.3695	41.3695	41.3695	41.3695	41.3695	41.3695	41.3695	41.3695	41.3695	41.3695	41.3695
alpha	3.7580	3.7580	3.7580	3.7580	3.7580	3.7580	3.7580	3.7580	3.7580	3.7580	3.7580	3.7580
util living area	0.9603	0.9473	0.9119	0.8322	0.6940	0.4836	0.3434	0.3464	0.6018	0.8334	0.9330	0.9657 (86)
MIT	19.8614	19.9834	20.2612	20.5969	20.8500	20.9713	20.9941	20.9941	20.9346	20.6688	20.2302	19.8230 (87)
Th 2	19.9827	19.9827	19.9827	19.9827	19.9827	19.9827	19.9827	19.9827	19.9827	19.9827	19.9827	19.9827 (88)
util rest of house	0.9516	0.9360	0.8928	0.7960	0.6304	0.3949	0.2397	0.2385	0.5108	0.7882	0.9160	0.9579 (89)
MIT 2	18.9807	19.0989	19.3653	19.6752	19.8887	19.9711	19.9816	19.9816	19.9518	19.7463	19.3408	18.9439 (90)
Living area fraction									fLA = Living area / (4) =			0.2224 (91)
MIT	19.1766	19.2956	19.5646	19.8802	20.1026	20.1936	20.2068	20.2069	20.1704	19.9516	19.5387	19.1394 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1766	19.2956	19.5646	19.8802	20.1026	20.1936	20.2068	20.2069	20.1704	19.9516	19.5387	19.1394 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9431	0.9268	0.8836	0.7919	0.6384	0.4138	0.2628	0.2626	0.5286	0.7866	0.9071	0.9499 (94)
Ext temp.	579.0482	611.4102	630.8960	607.1204	497.1161	330.4744	196.5612	188.7272	356.1373	490.6562	539.8965	551.5614 (95)
Heat loss rate W	5.6000	6.0000	7.6000	10.1000	13.1000	15.9000	17.7000	17.8000	15.4000	12.1000	8.6000	5.7000 (96)
Month fracti	1069.8583	1047.7185	942.8312	770.6969	551.8152	338.3407	197.5396	189.6639	375.9168	618.7157	861.9845	1059.0489 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating	365.1627	293.1992	232.0798	117.7751	40.6962	0.0000	0.0000	0.0000	0.0000	95.2763	231.9033	377.5707 (98)
RHI space heating demand												1753.6633 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	35.1100 (1b)	x 2.3900 (2b)	= 83.9129 (1b) - (3b)
First floor	35.1100 (1c)	x 2.6700 (2c)	= 93.7437 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.2200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 177.6566 (5)

2. Ventilation rate

										main	secondary	other	total	m3 per hour			
										heating	heating						
Number of chimneys										0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues										0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans																0 * 10 =	0.0000 (7a)
Number of passive vents																0 * 10 =	0.0000 (7b)
Number of flueless gas fires																0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans										= (6a)+(6b)+(7a)+(7b)+(7c) =					0.0000 / (5) =	0.0000 (8)	
Pressure test															Yes		
Measured/design AP50																4.2700	
Infiltration rate																0.2135 (18)	
Number of sides sheltered																1 (19)	
Shelter factor										(20) = 1 - [0.075 x (19)] =						0.9250 (20)	
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =						0.1975 (21)	
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec					
	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																	
	0.2518	0.2469	0.2419	0.2172	0.2123	0.1876	0.1876	0.1827	0.1975	0.2123	0.2222	0.2320 (22b)					
Mechanical extract ventilation - centralised																	
If mechanical ventilation:																0.5000 (23a)	
Effective ac	0.5018	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)					

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			12.2400	1.1450	14.0153		(27)
Ground Floor			35.1100	0.1200	4.2132	84.0000	2949.2400 (28a)
Brick and Block	84.9600	14.3600	70.6000	0.2400	16.9440	42.2200	2980.7320 (29a)
Pitched Roof	35.1100		35.1100	0.1000	3.5110	9.1000	319.5010 (30)
Total net area of external elements Aum(A, m ²)			155.1800				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	41.0155			(33)
Party Wall 1			42.9400	0.0000	0.0000	70.0000	3005.8000 (32)
GF Stud			60.0000			9.0000	540.0000 (32c)
First Floor			75.1900			9.0000	676.7100 (32c)
Internal Floor 1			35.1100			18.0000	631.9800 (32d)
Internal Ceiling 1			35.1100			18.0000	631.9800 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	11735.9430 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							167.1311 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.4729 (36)
Total fabric heat loss						(33) + (36) =	49.4884 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	29.4187	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133 (38)
Heat transfer coeff	78.9070	78.8017	78.8017	78.8017	78.8017	78.8017	78.8017	78.8017	78.8017	78.8017	78.8017	78.8017 (39)
Average = Sum(39)m / 12 =												78.8105 (39)
HLP	1.1237	1.1222	1.1222	1.1222	1.1222	1.1222	1.1222	1.1222	1.1222	1.1222	1.1222	1.1222 (40)
HLP (average)												1.1223 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2515 (42)
Average daily hot water use (litres/day)	87.6720 (43)

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Energy conte	96.4392	92.9324	89.4255	85.9186	82.4117	78.9048	78.9048	82.4117	85.9186	89.4255	92.9324	96.4392 (44)
Energy content (annual)	143.0166	125.0832	129.0747	112.5304	107.9756	93.1748	86.3401	99.0766	100.2598	116.8432	127.5435	138.5039 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum (45)m =		1379.4225 (45)
	21.4525	18.7625	19.3612	16.8796	16.1963	13.9762	12.9510	14.8615	15.0390	17.5265	19.1315	20.7756 (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	31.2121	28.1758	31.1694	30.1354	31.1192	30.0914	31.0795	31.1052	30.1154	31.1486	30.1769	31.2039 (61)
Total heat required for water heating calculated for each month	174.2288	153.2590	160.2441	142.6658	139.0948	123.2662	117.4197	130.1818	130.3752	147.9918	157.7204	169.7078 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
								Solar input (sum of months) = Sum (63)m =				0.0000 (63)
Output from w/h	174.2288	153.2590	160.2441	142.6658	139.0948	123.2662	117.4197	130.1818	130.3752	147.9918	157.7204	169.7078 (64)
Heat gains from water heating, kWh/month	55.3561	48.6341	50.7097	44.9502	43.6817	38.5035	36.4780	40.7193	40.8652	46.6375	49.9524	53.8535 (65)
								Total per year (kWh/year) = Sum (64)m =				1746.1553 (64)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	45.2696	40.2081	32.6994	24.7556	18.5051	15.6228	16.8809	21.9425	29.4512	37.3950	43.6455	46.5278 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	295.2388	298.3024	290.5821	274.1465	253.3995	233.9002	220.8735	217.8098	225.5301	241.9658	262.7128	282.2121 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602 (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)	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582 (71)
Water heating gains (Table 5)	74.4033	72.3722	68.1582	62.4309	58.7120	53.4770	49.0295	54.7302	56.7573	62.6848	69.3784	72.3838 (72)
Total internal gains	513.7010	509.6720	490.2290	460.1222	429.4058	401.7892	385.5732	393.2718	410.5278	440.8349	474.5259	499.9129 (73)

6. Solar gains

[Jan]		Area	Solar flux									
		m ²	Table 6a	g	Specific data	FF	Access					Gains
			W/m ²	or Table 6b	Specific data	Table 6c	factor					W
							Table 6d					
North		7.4900	10.6334	0.6300	0.7000	0.7700						24.3403 (74)
East		1.3200	19.6403	0.6300	0.7000	0.7700						7.9231 (76)
South		3.4300	46.7521	0.6300	0.7000	0.7700						49.0080 (78)
Solar gains	81.2713	142.2771	206.8063	279.7406	337.0639	345.6748	328.6246	283.7664	231.5216	160.3323	97.9972	69.1542 (83)
Total gains	594.9723	651.9491	697.0353	739.8628	766.4697	747.4640	714.1978	677.0382	642.0494	601.1672	572.5231	569.0671 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	41.3142	41.3695	41.3695	41.3695	41.3695	41.3695	41.3695	41.3695	41.3695	41.3695	41.3695	41.3695
util living area	3.7543	3.7580	3.7580	3.7580	3.7580	3.7580	3.7580	3.7580	3.7580	3.7580	3.7580	3.7580
	0.9716	0.9584	0.9327	0.8768	0.7718	0.6156	0.4684	0.5103	0.7198	0.8922	0.9563	0.9757 (86)
MIT	19.6507	19.8250	20.1013	20.4438	20.7421	20.9194	20.9777	20.9690	20.8511	20.4832	20.0003	19.5973 (87)
Th 2	19.9815	19.9827	19.9827	19.9827	19.9827	19.9827	19.9827	19.9827	19.9827	19.9827	19.9827	19.9827 (88)
util rest of house	0.9657	0.9499	0.9185	0.8499	0.7223	0.5362	0.3674	0.4078	0.6471	0.8629	0.9458	0.9706 (89)
MIT 2	18.7724	18.9438	19.2122	19.5364	19.8019	19.9400	19.9752	19.9713	19.8949	19.5801	19.1183	18.7210 (90)
Living area fraction									fLA = Living area / (4) =			0.2224 (91)
MIT	18.9678	19.1399	19.4099	19.7383	20.0110	20.1579	20.1982	20.1933	20.1076	19.7810	19.3145	18.9159 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9678	19.1399	19.4099	19.7383	20.0110	20.1579	20.1982	20.1933	20.1076	19.7810	19.3145	18.9159 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9583	0.9411	0.9089	0.8425	0.7238	0.5506	0.3895	0.4298	0.6568	0.8561	0.9372	0.9637 (94)
Ext temp.	570.1461	613.5524	633.5286	623.3026	554.7415	411.5662	278.1643	291.0233	421.7154	514.6487	536.5569	548.4020 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
	1157.3921	1122.1249	1017.3249	854.0735	654.9228	437.9699	283.5423	298.9159	473.4125	723.4769	962.5215	1159.6413 (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	436.9110	341.7607	285.5445	166.1550	74.5348	0.0000	0.0000	0.0000	0.0000	155.3682	306.6944	454.7621 (98)
Space heating												2221.7308 (98)
Space heating per m ²										(98) / (4) =		31.6396 (99)

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Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2449.5378 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	436.9110	341.7607	285.5445	166.1550	74.5348	0.0000	0.0000	0.0000	0.0000	155.3682	306.6944	454.7621	(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)	481.7100	376.8035	314.8231	183.1919	82.1773	0.0000	0.0000	0.0000	0.0000	171.2990	338.1416	501.3915	(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	174.2288	153.2590	160.2441	142.6658	139.0948	123.2662	117.4197	130.1818	130.3752	147.9918	157.7204	169.7078	(64)
Efficiency of water heater	89.6135	89.5213	89.3343	88.9524	88.2561	87.0000	87.0000	87.0000	87.0000	88.8565	89.4087	89.6637	(216)
(217)m	89.6135	89.5213	89.3343	88.9524	88.2561	87.0000	87.0000	87.0000	87.0000	88.8565	89.4087	89.6637	(217)
Fuel for water heating, kWh/month	194.4225	171.1984	179.3758	160.3846	157.6035	141.6852	134.9651	149.6342	149.8566	166.5515	176.4039	189.2715	(219)
Water heating fuel used												1971.3529	(219)
Annual totals kWh/year													
Space heating fuel - main system												2449.5378	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.4200)													
mechanical ventilation fans (SFP = 0.4200)												91.0312	(230a)
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												166.0312	(231)
Electricity for lighting (calculated in Appendix L)												319.7904	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.62 * 1080 * 1.00) =										-535.4442		-535.4442	(233)
Total delivered energy for all uses												4371.2682	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2449.5378	3.4800	85.2439 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1971.3529	3.4800	68.6031 (247)
Mechanical ventilation fans	91.0312	13.1900	12.0070 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	319.7904	13.1900	42.1804 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-535.4442	13.1900	-70.6251 (252)
Total energy cost			267.3018 (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] =	0.9744 (257)
SAP value		86.4076
SAP rating (Section 12)		86 (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	2449.5378	0.2160	529.1002 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1971.3529	0.2160	425.8122 (264)
Space and water heating			954.9124 (265)
Pumps and fans	166.0312	0.5190	86.1702 (267)
Energy for lighting	319.7904	0.5190	165.9712 (268)
Energy saving/generation technologies			
PV Unit	-535.4442	0.5190	-277.8955 (269)
Total kg/year			929.1583 (272)
CO2 emissions per m2			13.2300 (273)
EI value			89.1940
EI rating			89 (274)
EI band			B

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Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9070 = 3.837$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9070 = 0.2381$, stars = 4
Water heating energy efficiency	$3.48 / 0.8847 = 3.934$, stars = 4
Water heating environmental impact	$0.216 / 0.8847 = 0.2442$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	35.1100 (1b)	x 2.3900 (2b)	= 83.9129 (1b) - (3b)
First floor	35.1100 (1c)	x 2.6700 (2c)	= 93.7437 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.2200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 177.6566 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					4.2700
Infiltration rate					0.2135 (18)
Number of sides sheltered					1 (19)
Shelter factor			(20) = 1 - [0.075 x (19)]	=	0.9250 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20)	=	0.1975 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000 (22)
Wind factor	1.1750	1.1000	1.1000	1.0000	1.0250	0.9750	0.9750	0.9500	0.9500	1.0250	1.0000	1.0250 (22a)
Adj infilt rate	0.2320	0.2172	0.2172	0.1975	0.2024	0.1926	0.1926	0.1876	0.1876	0.2024	0.1975	0.2024 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			12.2400	1.1450	14.0153		(27)
Ground Floor			35.1100	0.1200	4.2132	84.0000	2949.2400 (28a)
Brick and Block	84.9600	14.3600	70.6000	0.2400	16.9440	42.2200	2980.7320 (29a)
Pitched Roof	35.1100		35.1100	0.1000	3.5110	9.1000	319.5010 (30)
Total net area of external elements Aum(A, m ²)			155.1800				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	41.0155			(33)
Party Wall 1			42.9400	0.0000	0.0000	70.0000	3005.8000 (32)
GF Stud			60.0000			9.0000	540.0000 (32c)
First Floor			75.1900			9.0000	676.7100 (32c)
Internal Floor 1			35.1100			18.0000	631.9800 (32d)
Internal Ceiling 1			35.1100			18.0000	631.9800 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	11735.9430 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							167.1311 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.4729 (36)
Total fabric heat loss						(33) + (36) =	49.4884 (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	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133 (38)
Average = Sum(39)m / 12 =	78.8017	78.8017	78.8017	78.8017	78.8017	78.8017	78.8017	78.8017	78.8017	78.8017	78.8017	78.8017 (39)
HLP	1.1222	1.1222	1.1222	1.1222	1.1222	1.1222	1.1222	1.1222	1.1222	1.1222	1.1222	1.1222 (40)
HLP (average)												1.1222 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2515 (42)
Average daily hot water use (litres/day)												87.6720 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Energy conte	96.4392	92.9324	89.4255	85.9186	82.4117	78.9048	78.9048	82.4117	85.9186	89.4255	92.9324	96.4392 (44)
143.0166	125.0832	129.0747	112.5304	107.9756	93.1748	86.3401	99.0766	100.2598	116.8432	127.5435	138.5039 (45)	1379.4225 (45)
Energy content (annual)												
Distribution loss (46)m = 0.15 x (45)m												
21.4525	18.7625	19.3612	16.8796	16.1963	13.9762	12.9510	14.8615	15.0390	17.5265	19.1315	20.7756 (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	31.2121	28.1758	31.1694	30.1354	31.1192	30.0914	31.0795	31.1052	30.1154	31.1486	30.1769	31.2039 (61)
Total heat required for water heating calculated for each month												
174.2288	153.2590	160.2441	142.6658	139.0948	123.2662	117.4197	130.1818	130.3752	147.9918	157.7204	169.7078 (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 (63)	
Solar input (sum of months) = Sum(63)m =											0.0000 (63)	
Output from w/h												
174.2288	153.2590	160.2441	142.6658	139.0948	123.2662	117.4197	130.1818	130.3752	147.9918	157.7204	169.7078 (64)	
Heat gains from water heating, kWh/month												
55.3561	48.6341	50.7097	44.9502	43.6817	38.5035	36.4780	40.7193	40.8652	46.6375	49.9524	53.8535 (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
135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
45.2696	40.2081	32.6994	24.7556	18.5051	15.6228	16.8809	21.9425	29.4512	37.3950	43.6455	46.5278 (67)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
295.2388	298.3024	290.5821	274.1465	253.3995	233.9002	220.8735	217.8098	225.5301	241.9658	262.7128	282.2121 (68)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602 (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 (70)	
Losses e.g. evaporation (negative values) (Table 5)												
-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582 (71)	
Water heating gains (Table 5)												
74.4033	72.3722	68.1582	62.4309	58.7120	53.4770	49.0295	54.7302	56.7573	62.6848	69.3784	72.3838 (72)	
Total internal gains												
513.7010	509.6720	490.2290	460.1222	429.4058	401.7892	385.5732	393.2718	410.5278	440.8349	474.5259	499.9129 (73)	

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W		
North				7.4900	13.4684	0.6300	0.7000	0.7700	30.8298 (74)			
East				1.3200	25.1733	0.6300	0.7000	0.7700	10.1551 (76)			
South				3.4300	56.5862	0.6300	0.7000	0.7700	59.3166 (78)			
Solar gains	100.3015	150.0403	223.7650	306.5532	349.2470	396.8048	362.2780	325.3717	263.2108	182.9298	120.6667	80.7253 (83)
Total gains	614.0025	659.7123	713.9940	766.6754	778.6527	798.5940	747.8512	718.6435	673.7386	623.7647	595.1926	580.6383 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
41.3695	41.3695	41.3695	41.3695	41.3695	41.3695	41.3695	41.3695	41.3695	41.3695	41.3695	41.3695	41.3695
alpha	3.7580	3.7580	3.7580	3.7580	3.7580	3.7580	3.7580	3.7580	3.7580	3.7580	3.7580	3.7580
util living area												
0.9603	0.9473	0.9119	0.8322	0.6940	0.4836	0.3434	0.3464	0.6018	0.8334	0.9330	0.9657 (86)	
MIT	19.8614	19.9834	20.2612	20.5969	20.8500	20.9713	20.9941	20.9941	20.9346	20.6688	20.2302	19.8230 (87)
Th 2	19.9827	19.9827	19.9827	19.9827	19.9827	19.9827	19.9827	19.9827	19.9827	19.9827	19.9827	19.9827 (88)
util rest of house												
0.9516	0.9360	0.8928	0.7960	0.6304	0.3949	0.2397	0.2385	0.5108	0.7882	0.9160	0.9579 (89)	
MIT 2	18.9807	19.0989	19.3653	19.6752	19.8887	19.9711	19.9816	19.9816	19.9518	19.7463	19.3408	18.9439 (90)
Living area fraction									fLA = Living area / (4) =			0.2224 (91)
MIT	19.1766	19.2956	19.5646	19.8802	20.1026	20.1936	20.2068	20.2069	20.1704	19.9516	19.5387	19.1394 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1766	19.2956	19.5646	19.8802	20.1026	20.1936	20.2068	20.2069	20.1704	19.9516	19.5387	19.1394 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.9431	0.9268	0.8836	0.7919	0.6384	0.4138	0.2628	0.2626	0.5286	0.7866	0.9071	0.9499 (94)	
Useful gains	579.0482	611.4102	630.8960	607.1204	497.1161	330.4744	196.5612	188.7272	356.1373	490.6562	539.8965	551.5614 (95)
Ext temp.	5.6000	6.0000	7.6000	10.1000	13.1000	15.9000	17.7000	17.8000	15.4000	12.1000	8.6000	5.7000 (96)
Heat loss rate W												
1069.8583	1047.7185	942.8312	770.6969	551.8152	338.3407	197.5396	189.6639	375.9168	618.7157	861.9845	1059.0489 (97)	
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)	
Space heating kWh												
365.1627	293.1992	232.0798	117.7751	40.6962	0.0000	0.0000	0.0000	0.0000	95.2763	231.9033	377.5707 (98)	
Space heating												1753.6633 (98)
Space heating per m2												(98) / (4) = 24.9738 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1933.4766 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	365.1627	293.1992	232.0798	117.7751	40.6962	0.0000	0.0000	0.0000	0.0000	95.2763	231.9033	377.5707	(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)	402.6050	323.2626	255.8763	129.8512	44.8690	0.0000	0.0000	0.0000	0.0000	105.0455	255.6817	416.2852	(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	174.2288	153.2590	160.2441	142.6658	139.0948	123.2662	117.4197	130.1818	130.3752	147.9918	157.7204	169.7078	(64)
Efficiency of water heater (217)m	89.4709	89.3949	89.1514	88.6351	87.8108	87.0000	87.0000	87.0000	87.0000	88.4126	89.1650	89.5194	(217)
Fuel for water heating, kWh/month	194.7323	171.4404	179.7438	160.9586	158.4028	141.6852	134.9651	149.6342	149.8566	167.3877	176.8860	189.5765	(219)
Water heating fuel used												1975.2694	(219)
Annual totals kWh/year													
Space heating fuel - main system												1933.4766	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.4200)													
mechanical ventilation fans (SFP = 0.4200)													91.0312 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													166.0312 (231)
Electricity for lighting (calculated in Appendix L)													319.7904 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 + 0.62 + 1206 + 1.00) =										-598.1811		-598.1811	(233)
Total delivered energy for all uses												3796.3867	(238)

10a. Fuel costs - using BEDF prices (490)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1933.4766	3.6300	70.1852 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1975.2694	3.6300	71.7023 (247)
Mechanical ventilation fans	91.0312	19.4400	17.6965 (249)
Pumps and fans for heating	75.0000	19.4400	14.5800 (249)
Energy for lighting	319.7904	19.4400	62.1673 (250)
Additional standing charges			95.0000 (251)
Energy saving/generation technologies			
PV Unit	-598.1811	19.4400	-116.2864 (252)
Total energy cost			215.0448 (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	1933.4766	0.2160	417.6310 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1975.2694	0.2160	426.6582 (264)
Space and water heating			844.2891 (265)
Pumps and fans	166.0312	0.5190	86.1702 (267)
Energy for lighting	319.7904	0.5190	165.9712 (268)
Energy saving/generation technologies			
PV Unit	-598.1811	0.5190	-310.4560 (269)
Total kg/year			785.9746 (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	1933.4766	1.2200	2358.8415 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1975.2694	1.2200	2409.8287 (264)
Space and water heating			4768.6702 (265)
Pumps and fans	166.0312	3.0700	509.7159 (267)
Energy for lighting	319.7904	3.0700	981.7567 (268)

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Energy saving/generation technologies			
PV Unit	-598.1811	3.0700	-1836.4159 (269)
Primary energy kWh/year			4423.7269 (272)
Primary energy kWh/m2/year			62.9981 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:	B 86
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	-£ 26	-184 kg (23.4%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£26 2.62 kg/m²	B 88	B 91
Total Savings	£26 2.62 kg/m²		

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

Fuel prices for cost data on this page from database revision number 490 TEST (31 Jan 2022)
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	£94	£104	-£10
Mains gas	£237	£202	£35
Space heating	£197	£197	£0
Water heating	£72	£46	£26
Lighting	£62	£62	£0
Generated (PV)	-£116	-£116	£0
Total cost of fuels	£215	£190	£25
Total cost of uses	£215	£189	£26
Delivered energy	54 kWh/m²	41 kWh/m²	13 kWh/m²
Carbon dioxide emissions	0.8 tonnes	0.6 tonnes	0.2 tonnes
CO2 emissions per m²	11 kg/m²	9 kg/m²	3 kg/m²
Primary energy	63 kWh/m²	48 kWh/m²	15 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	35.1100 (1b)	x 2.3900 (2b)	= 83.9129 (1b) - (3b)
First floor	35.1100 (1c)	x 2.6700 (2c)	= 93.7437 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.2200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 177.6566 (5)

2. Ventilation rate

					main heating	secondary heating	other		total	m3 per hour		
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans											0 * 10 =	0.0000 (7a)
Number of passive vents											0 * 10 =	0.0000 (7b)
Number of flueless gas fires											0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =											0.0000 / (5) =	0.0000 (8)
Pressure test											Yes	
Measured/design AP50												4.2700
Infiltration rate												0.2135 (18)
Number of sides sheltered												1 (19)
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.1975 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	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	0.2518	0.2469	0.2419	0.2172	0.2123	0.1876	0.1876	0.1827	0.1975	0.2123	0.2222	0.2320 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5018	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			12.2400	1.1450	14.0153		(27)
Ground Floor			35.1100	0.1200	4.2132	84.0000	2949.2400 (28a)
Brick and Block	84.9600	14.3600	70.6000	0.2400	16.9440	42.2200	2980.7320 (29a)
Pitched Roof	35.1100		35.1100	0.1000	3.5110	9.1000	319.5010 (30)
Total net area of external elements Aum(A, m ²)			155.1800				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	41.0155			(33)
Party Wall 1			42.9400	0.0000	0.0000	70.0000	3005.8000 (32)
GF Stud			60.0000			9.0000	540.0000 (32c)
First Floor			75.1900			9.0000	676.7100 (32c)
Internal Floor 1			35.1100			18.0000	631.9800 (32d)
Internal Ceiling 1			35.1100			18.0000	631.9800 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	11735.9430 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							167.1311 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.4729 (36)
Total fabric heat loss						(33) + (36) =	49.4884 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	29.4187	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133 (38)
Heat transfer coeff	78.9070	78.8017	78.8017	78.8017	78.8017	78.8017	78.8017	78.8017	78.8017	78.8017	78.8017	78.8017 (39)
Average = Sum(39)m / 12 =												78.8105 (39)
HLP	1.1237	1.1222	1.1222	1.1222	1.1222	1.1222	1.1222	1.1222	1.1222	1.1222	1.1222	1.1222 (40)
HLP (average)												1.1223 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2515 (42)
Average daily hot water use (litres/day)	87.6720 (43)

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Energy conte	96.4392	92.9324	89.4255	85.9186	82.4117	78.9048	78.9048	82.4117	85.9186	89.4255	92.9324	96.4392 (44)
Energy content (annual)	143.0166	125.0832	129.0747	112.5304	107.9756	93.1748	86.3401	99.0766	100.2598	116.8432	127.5435	138.5039 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum (45)m =		1379.4225 (45)
	21.4525	18.7625	19.3612	16.8796	16.1963	13.9762	12.9510	14.8615	15.0390	17.5265	19.1315	20.7756 (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	31.2121	28.1758	31.1694	30.1354	31.1192	30.0914	31.0795	31.1052	30.1154	31.1486	30.1769	31.2039 (61)
Total heat required for water heating calculated for each month	174.2288	153.2590	160.2441	142.6658	139.0948	123.2662	117.4197	130.1818	130.3752	147.9918	157.7204	169.7078 (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												1.3148 (H8)
Utilisation factor												0.5326 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												87.6720 (H14)
Volume ratio Veff/V												0.8555 (H15)
Solar storage volume factor												0.9688 (H16)
Solar input	-23.8605	-39.8163	-67.8118	-90.8811	-112.2760	-110.3852	-108.9264	-95.1695	-74.5368	-50.8999	-28.3020	-822.8328 (H17)
Solar input (sum of months) = Sum (63)m =												-19.9672 (63)
Output from w/h	150.3682	113.4427	92.4323	51.7847	26.8188	12.8810	8.4933	35.0122	55.8384	97.0919	129.4184	149.7406 (64)
Total per year (kWh/year) = Sum (64)m =												923.3225 (64)
Heat gains from water heating, kWh/month	55.3561	48.6341	50.7097	44.9502	43.6817	38.5035	36.4780	40.7193	40.8652	46.6375	49.9524	53.8535 (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	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	45.2696	40.2081	32.6994	24.7556	18.5051	15.6228	16.8809	21.9425	29.4512	37.3950	43.6455	46.5278	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	295.2388	298.3024	290.5821	274.1465	253.3995	233.9002	220.8735	217.8098	225.5301	241.9658	262.7128	282.2121	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	(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)	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	(71)
Water heating gains (Table 5)	74.4033	72.3722	68.1582	62.4309	58.7120	53.4770	49.0295	54.7302	56.7573	62.6848	69.3784	72.3838	(72)
Total internal gains	513.7010	509.6720	490.2290	460.1222	429.4058	401.7892	385.5732	393.2718	410.5278	440.8349	474.5259	499.9129	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.4900	10.6334	0.6300		0.7000	0.7700	24.3403	(74)
East	1.3200	19.6403	0.6300		0.7000	0.7700	7.9231	(76)
South	3.4300	46.7521	0.6300		0.7000	0.7700	49.0080	(78)

Solar gains	81.2713	142.2771	206.8063	279.7406	337.0639	345.6748	328.6246	283.7664	231.5216	160.3323	97.9972	69.1542	(83)
Total gains	594.9723	651.9491	697.0353	739.8628	766.4697	747.4640	714.1978	677.0382	642.0494	601.1672	572.5231	569.0671	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	41.3142	41.3695	41.3695	41.3695	41.3695	41.3695	41.3695	41.3695	41.3695	41.3695	41.3695	41.3695	
alpha	3.7543	3.7580	3.7580	3.7580	3.7580	3.7580	3.7580	3.7580	3.7580	3.7580	3.7580	3.7580	
util living area	0.9716	0.9584	0.9327	0.8768	0.7718	0.6156	0.4684	0.5103	0.7198	0.8922	0.9563	0.9757	(86)
MIT	19.6507	19.8250	20.1013	20.4438	20.7421	20.9194	20.9777	20.9690	20.8511	20.4832	20.0003	19.5973	(87)
Th 2	19.9815	19.9827	19.9827	19.9827	19.9827	19.9827	19.9827	19.9827	19.9827	19.9827	19.9827	19.9827	(88)
util rest of house	0.9657	0.9499	0.9185	0.8499	0.7223	0.5362	0.3674	0.4078	0.6471	0.8629	0.9458	0.9706	(89)
MIT 2	18.7724	18.9438	19.2122	19.5364	19.8019	19.9400	19.9752	19.9713	19.8949	19.5801	19.1183	18.7210	(90)
Living area fraction									fLA = Living area / (4) =			0.2224	(91)
MIT	18.9678	19.1399	19.4099	19.7383	20.0110	20.1579	20.1982	20.1933	20.1076	19.7810	19.3145	18.9159	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9678	19.1399	19.4099	19.7383	20.0110	20.1579	20.1982	20.1933	20.1076	19.7810	19.3145	18.9159	(93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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	0.9411	0.9089	0.8425	0.7238	0.5506	0.3895	0.4298	0.6568	0.8561	0.9372	0.9637	(94)
Useful gains	570.1461	613.5524	633.5286	623.3026	554.7415	411.5662	278.1643	291.0233	421.7154	514.6487	536.5569	548.4020	(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	1157.3921	1122.1249	1017.3249	854.0735	654.9228	437.9699	283.5423	298.9159	473.4125	723.4769	962.5215	1159.6413	(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	436.9110	341.7607	285.5445	166.1550	74.5348	0.0000	0.0000	0.0000	0.0000	155.3682	306.6944	454.7621	(98)
Space heating												2221.7308	(98)
Space heating per m2											(98) / (4) =	31.6396	(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													2449.5378	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	436.9110	341.7607	285.5445	166.1550	74.5348	0.0000	0.0000	0.0000	0.0000	155.3682	306.6944	454.7621	(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)	481.7100	376.8035	314.8231	183.1919	82.1773	0.0000	0.0000	0.0000	0.0000	171.2990	338.1416	501.3915	(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	150.3682	113.4427	92.4323	51.7847	26.8188	12.8810	8.4933	35.0122	55.8384	97.0919	129.4184	149.7406	(64)	
Efficiency of water heater	89.7230	89.7488	89.7664	89.7926	89.6907	87.0000	87.0000	87.0000	87.0000	89.2404	89.5696	89.7545	(216)	
Fuel for water heating, kWh/month	167.5916	126.4003	102.9698	57.6715	29.9015	14.8057	9.7624	40.2439	64.1820	108.7982	144.4892	166.8337	(219)	
Water heating fuel used												1033.6497	(219)	
Annual totals kWh/year														
Space heating fuel - main system												2449.5378	(211)	
Space heating fuel - secondary												0.0000	(215)	
Electricity for pumps and fans:														
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.4200)														
mechanical ventilation fans (SFP = 0.4200)													91.0312	(230a)
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													216.0312	(231)
Electricity for lighting (calculated in Appendix L)													319.7904	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 0.62 * 1080 * 1.00) =										-535.4442			-535.4442	(233)
Total delivered energy for all uses													3483.5650	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2449.5378	3.4800	85.2439	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1033.6497	3.4800	35.9710	(247)
Mechanical ventilation fans	91.0312	13.1900	12.0070	(249)
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	319.7904	13.1900	42.1804	(250)
Additional standing charges			120.0000	(251)
Energy saving/generation technologies				
PV Unit	-535.4442	13.1900	-70.6251	(252)
Total energy cost			241.2647	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200	(256)
Energy cost factor (ECF)		0.8795	(257)
SAP value	[(255) x (256)] / [(4) + 45.0] =	87.7316	
SAP rating (Section 12)		88	(258)
SAP band		B	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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	2449.5378	0.2160	529.1002 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1033.6497	0.2160	223.2683 (264)
Space and water heating			752.3685 (265)
Pumps and fans	216.0312	0.5190	112.1202 (267)
Energy for lighting	319.7904	0.5190	165.9712 (268)
Energy saving/generation technologies			
PV Unit	-535.4442	0.5190	-277.8955 (269)
Total kg/year			752.5644 (272)
CO2 emissions per m2			10.7200 (273)
EI value			91.2477
EI rating			91 (274)
EI band			B

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	35.1100 (1b)	x 2.3900 (2b)	= 83.9129 (1b) - (3b)
First floor	35.1100 (1c)	x 2.6700 (2c)	= 93.7437 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.2200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 177.6566 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour							
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)							
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)							
Number of intermittent fans					0 * 10 = 0.0000 (7a)							
Number of passive vents					0 * 10 = 0.0000 (7b)							
Number of flueless gas fires					0 * 40 = 0.0000 (7c)							
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour							
Pressure test				0.0000 / (5) =	0.0000 (8)							
Measured/design AP50					Yes							
Infiltration rate					4.2700							
Number of sides sheltered					0.2135 (18)							
					1 (19)							
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)							
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.1975 (21)							
Wind speed	Jan 4.7000	Feb 4.4000	Mar 4.4000	Apr 4.0000	May 4.1000	Jun 3.9000	Jul 3.9000	Aug 3.8000	Sep 3.8000	Oct 4.1000	Nov 4.0000	Dec 4.1000 (22)
Wind factor	1.1750	1.1000	1.1000	1.0000	1.0250	0.9750	0.9750	0.9500	0.9500	1.0250	1.0000	1.0250 (22a)
Adj infilt rate	0.2320	0.2172	0.2172	0.1975	0.2024	0.1926	0.1926	0.1876	0.1876	0.2024	0.1975	0.2024 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			12.2400	1.1450	14.0153		(27)
Ground Floor			35.1100	0.1200	4.2132	84.0000	2949.2400 (28a)
Brick and Block	84.9600	14.3600	70.6000	0.2400	16.9440	42.2200	2980.7320 (29a)
Pitched Roof	35.1100		35.1100	0.1000	3.5110	9.1000	319.5010 (30)
Total net area of external elements Aum(A, m ²)			155.1800				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	41.0155			(33)
Party Wall 1			42.9400	0.0000	0.0000	70.0000	3005.8000 (32)
GF Stud			60.0000			9.0000	540.0000 (32c)
First Floor			75.1900			9.0000	676.7100 (32c)
Internal Floor 1			35.1100			18.0000	631.9800 (32d)
Internal Ceiling 1			35.1100			18.0000	631.9800 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	11735.9430 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							167.1311 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.4729 (36)
Total fabric heat loss						(33) + (36) =	49.4884 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133 (38)
Heat transfer coeff	78.8017	78.8017	78.8017	78.8017	78.8017	78.8017	78.8017	78.8017	78.8017	78.8017	78.8017	78.8017 (39)
Average = Sum(39)m / 12 =												78.8017 (39)
HLP	1.1222	1.1222	1.1222	1.1222	1.1222	1.1222	1.1222	1.1222	1.1222	1.1222	1.1222	1.1222 (40)
HLP (average)												1.1222 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2515 (42)
Average daily hot water use (litres/day) 87.6720 (43)

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Energy conte	96.4392	92.9324	89.4255	85.9186	82.4117	78.9048	78.9048	82.4117	85.9186	89.4255	92.9324	96.4392 (44)
Energy content (annual)	143.0166	125.0832	129.0747	112.5304	107.9756	93.1748	86.3401	99.0766	100.2598	116.8432	127.5435	138.5039 (45)
Distribution loss (46)m = 0.15 x (45)m												1379.4225 (45)
	21.4525	18.7625	19.3612	16.8796	16.1963	13.9762	12.9510	14.8615	15.0390	17.5265	19.1315	20.7756 (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	31.2121	28.1758	31.1694	30.1354	31.1192	30.0914	31.0795	31.1052	30.1154	31.1486	30.1769	31.2039 (61)
Total heat required for water heating calculated for each month	174.2288	153.2590	160.2441	142.6658	139.0948	123.2662	117.4197	130.1818	130.3752	147.9918	157.7204	169.7078 (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												1206.0102 (H5)
Overshading factor												0.8000 (H6)
Solar energy available												2026.0972 (H7)
Adjustment factor for showers												1.0000 (H7a)
Solar-to-load ratio												1.4688 (H8)
Utilisation factor												0.4938 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												87.6720 (H14)
Volume ratio Veff/V												0.8555 (H15)
Solar storage volume factor												0.9688 (H16)
Solar input	-27.8102	-39.5493	-68.6282	-92.3165	-107.2780	-116.6874	-110.6374	-100.8906	-78.9669	-54.5791	-32.8932	-852.2574 (H17)
Solar input (sum of months) = Sum (63)m =												-852.2574 (63)
Output from w/h	146.4185	113.7097	91.6159	50.3493	31.8168	6.5788	6.7822	29.2912	51.4084	93.4127	124.8272	147.6872 (64)
Total per year (kWh/year) = Sum (64)m =												893.8979 (64)
Heat gains from water heating, kWh/month	55.3561	48.6341	50.7097	44.9502	43.6817	38.5035	36.4780	40.7193	40.8652	46.6375	49.9524	53.8535 (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	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	45.2696	40.2081	32.6994	24.7556	18.5051	15.6228	16.8809	21.9425	29.4512	37.3950	43.6455	46.5278	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	295.2388	298.3024	290.5821	274.1465	253.3995	233.9002	220.8735	217.8098	225.5301	241.9658	262.7128	282.2121	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	(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)	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	(71)
Water heating gains (Table 5)	74.4033	72.3722	68.1582	62.4309	58.7120	53.4770	49.0295	54.7302	56.7573	62.6848	69.3784	72.3838	(72)
Total internal gains	513.7010	509.6720	490.2290	460.1222	429.4058	401.7892	385.5732	393.2718	410.5278	440.8349	474.5259	499.9129	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	7.4900	13.4684	0.6300	0.7000	0.7700	30.8298 (74)
East	1.3200	25.1733	0.6300	0.7000	0.7700	10.1551 (76)
South	3.4300	56.5862	0.6300	0.7000	0.7700	59.3166 (78)

Solar gains	100.3015	150.0403	223.7650	306.5532	349.2470	396.8048	362.2780	325.3717	263.2108	182.9298	120.6667	80.7253 (83)
Total gains	614.0025	659.7123	713.9940	766.6754	778.6527	798.5940	747.8512	718.6435	673.7386	623.7647	595.1926	580.6383 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	41.3695	41.3695	41.3695	41.3695	41.3695	41.3695	41.3695	41.3695	41.3695	41.3695	41.3695	41.3695
alpha	3.7580	3.7580	3.7580	3.7580	3.7580	3.7580	3.7580	3.7580	3.7580	3.7580	3.7580	3.7580
util living area												
	0.9603	0.9473	0.9119	0.8322	0.6940	0.4836	0.3434	0.3464	0.6018	0.8334	0.9330	0.9657 (86)
MIT	19.8614	19.9834	20.2612	20.5969	20.8500	20.9713	20.9941	20.9941	20.9346	20.6688	20.2302	19.8230 (87)
Th 2	19.9827	19.9827	19.9827	19.9827	19.9827	19.9827	19.9827	19.9827	19.9827	19.9827	19.9827	19.9827 (88)
util rest of house												
	0.9516	0.9360	0.8928	0.7960	0.6304	0.3949	0.2397	0.2385	0.5108	0.7882	0.9160	0.9579 (89)
MIT 2	18.9807	19.0989	19.3653	19.6752	19.8887	19.9711	19.9816	19.9816	19.9518	19.7463	19.3408	18.9439 (90)
Living area fraction												
MIT	19.1766	19.2956	19.5646	19.8802	20.1026	20.1936	20.2068	20.2069	20.1704	19.9516	19.5387	19.1394 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1766	19.2956	19.5646	19.8802	20.1026	20.1936	20.2068	20.2069	20.1704	19.9516	19.5387	19.1394 (93)

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Calculation Type: New Build (As Built)

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	0.9431	0.9268	0.8836	0.7919	0.6384	0.4138	0.2628	0.2626	0.5286	0.7866	0.9071	0.9499	(94)
Useful gains	579.0482	611.4102	630.8960	607.1204	497.1161	330.4744	196.5612	188.7272	356.1373	490.6562	539.8965	551.5614	(95)
Ext temp.	5.6000	6.0000	7.6000	10.1000	13.1000	15.9000	17.7000	17.8000	15.4000	12.1000	8.6000	5.7000	(96)
Heat loss rate W	1069.8583	1047.7185	942.8312	770.6969	551.8152	338.3407	197.5396	189.6639	375.9168	618.7157	861.9845	1059.0489	(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	365.1627	293.1992	232.0798	117.7751	40.6962	0.0000	0.0000	0.0000	0.0000	95.2763	231.9033	377.5707	(98)
Space heating												1753.6633	(98)
Space heating per m2											(98) / (4) =	24.9738	(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													1933.4766	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	365.1627	293.1992	232.0798	117.7751	40.6962	0.0000	0.0000	0.0000	0.0000	95.2763	231.9033	377.5707	(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)	402.6050	323.2626	255.8763	129.8512	44.8690	0.0000	0.0000	0.0000	0.0000	105.0455	255.6817	416.2852	(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	146.4185	113.7097	91.6159	50.3493	31.8168	6.5788	6.7822	29.2912	51.4084	93.4127	124.8272	147.6872	(64)	
Efficiency of water heater	89.6093	89.6347	89.6212	89.5593	89.0385	87.0000	87.0000	87.0000	87.0000	88.8297	89.3700	89.6282	(216)	
(217)m	89.6093	89.6347	89.6212	89.5593	89.0385	87.0000	87.0000	87.0000	87.0000	88.8297	89.3700	89.6282	(217)	
Fuel for water heating, kWh/month	163.3966	126.8590	102.2257	56.2190	35.7337	7.5618	7.7957	33.6680	59.0901	105.1593	139.6745	164.7776	(219)	
Water heating fuel used												1002.1609	(219)	
Annual totals kWh/year														
Space heating fuel - main system												1933.4766	(211)	
Space heating fuel - secondary												0.0000	(215)	
Electricity for pumps and fans:														
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.4200)														
mechanical ventilation fans (SFP = 0.4200)													91.0312	(230a)
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													216.0312	(231)
Electricity for lighting (calculated in Appendix L)													319.7904	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 0.62 * 1206 * 1.00) =													-598.1811	(233)
Total delivered energy for all uses													2873.2781	(238)

10a. Fuel costs - using BEDF prices (490)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1933.4766	3.6300	70.1852	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1002.1609	3.6300	36.3784	(247)
Mechanical ventilation fans	91.0312	19.4400	17.6965	(249)
Pumps and fans for heating	75.0000	19.4400	14.5800	(249)
Pump for solar water heating	50.0000	19.4400	9.7200	(249)
Energy for lighting	319.7904	19.4400	62.1673	(250)
Additional standing charges			95.0000	(251)
Energy saving/generation technologies				
PV Unit	-598.1811	19.4400	-116.2864	(252)
Total energy cost			189.4410	(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	1933.4766	0.2160	417.6310	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1002.1609	0.2160	216.4667	(264)
Space and water heating			634.0977	(265)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Pumps and fans	216.0312	0.5190	112.1202 (267)
Energy for lighting	319.7904	0.5190	165.9712 (268)
Energy saving/generation technologies			
PV Unit	-598.1811	0.5190	-310.4560 (269)
Total kg/year			601.7332 (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	1933.4766	1.2200	2358.8415 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1002.1609	1.2200	1222.6363 (264)
Space and water heating			3581.4777 (265)
Pumps and fans	216.0312	3.0700	663.2159 (267)
Energy for lighting	319.7904	3.0700	981.7567 (268)
Energy saving/generation technologies			
PV Unit	-598.1811	3.0700	-1836.4159 (269)
Primary energy kWh/year			3390.0344 (272)
Primary energy kWh/m2/year			48.2773 (273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0647 Plot 2	Issued on Date	15/02/2022
Assessment Reference	As Built	Prop Type Ref	D (HA/AR)
Project	2 Oram Way, WEST END, SO30 3JW		
Calculation Type	New Build (As Built)		

SAP Rating	86 B	DER	15.11	TER	19.74
Environmental	89 B	% DER<TER	23.45		
CO ₂ Emissions (t/year)	0.79	DFEE	46.95	TTEE	55.82
General Requirements Compliance	Pass	% DFEE<TTEE	15.90		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.com	Assessor ID	E477-0001
Client	Foreman Homes, FORE		

Building Elements

Roof 000002 - Mineral Wool between and above

Roof Type: Pitched Roof, insulated flat ceiling

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

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

Unheated space: None

Total thickness: 463 mm

U-value: 0.10 W/m² K

Kappa: 9.10 kJ/m² K

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0647 Plot 2	Issued on Date	15/02/2022
Assessment Reference	As Built	Prop Type Ref	D (HA/AR)
Project	2 Oram Way, WEST END, SO30 3JW		
Calculation Type	New Build (As Built)		

SAP Rating	86 B	DER	15.11	TER	19.74
Environmental	89 B	% DER<TER	23.45		
CO ₂ Emissions (t/year)	0.79	DFEE	46.95	TFEE	55.82
General Requirements Compliance	Pass	% DFEE<TFEE	15.90		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.com	Assessor ID	E477-0001
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Client	Foreman Homes, FORE
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Building Elements

Wall 000001

Wall Type: Standard Wall

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

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

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

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0647 Plot 2	Issued on Date	15/02/2022
Assessment Reference	As Built	Prop Type Ref	D (HA/AR)
Project	2 Oram Way, WEST END, SO30 3JW		
Calculation Type	New Build (As Built)		

SAP Rating	86 B	DER	15.11	TER	19.74
Environmental	89 B	% DER<TER	23.45		
CO ₂ Emissions (t/year)	0.79	DFEE	46.95	TFEE	55.82
General Requirements Compliance	Pass	% DFEE<TFEE	15.90		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.com	Assessor ID	E477-0001
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Client	Foreman Homes, FORE
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Building Elements

Floor 000003 - Worst Case Slab

Floor Type: Slab On Ground Floor

Area = 35.11 m², Perimeter = 16.79 m, Wall thickness = 275.00 mm, Soil: Unknown

Horizontal edge insulation: none

Vertical edge insulation: none

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	Concrete, medium density						
	Main construction	100	1.3500	0.0741	100.00		
Layer 2	Polythene, 1000 gauge						
	Main construction	0.5	0.0000	0.0000	100.00		
Layer 3	Celotex XR4000						
	Main construction	150	0.0220	6.8182	100.00		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 4	Polythene, 500 gauge						
	Main construction	0.5	0.0000	0.0000	100.00		
Layer 5	Screed						
	Main construction	70	1.1500	0.0609	100.00	1200	1000
Int surface				0.1700			

Total resistance: Upper limit = 6.953 m² K/W Lower limit = 6.953 m² K/W Average = 6.953 m² K/W

Total correction = 0.0096 m² K/W

U-value (unrounded) = 0.12 W/m² K

Unheated space: None

Total thickness: 321 mm

U-value: 0.12 W/m² K

Kappa: 84.00 kJ/m² K

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Property Reference	SAP 0647 Plot 2				Issued on Date	15/02/2022
Assessment Reference	As Built	Prop Type Ref	D (HA/AR)			
Property	2 Oram Way, WEST END, SO30 3JW					
SAP Rating		86 B	DER	15.11	TER	19.74
Environmental		89 B	% DER<TER	23.45		
CO ₂ Emissions (t/year)		0.79	DFEE	46.95	TFEE	55.82
General Requirements Compliance		Pass	% DFEE<TFEE	15.90		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.com				Assessor ID	E477-0001
Client	Foreman Homes, FORE					

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

Orientation	South
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	2020
4.0 Sheltered Sides	1
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements		Heat Loss Perimeter	Internal Floor Area	Average Storey Height
	Ground Floor:	16.79 m	35.11 m ²	2.39 m
	1st Storey:	16.79 m	35.11 m ²	2.67 m

7.0 Living Area	15.62	m ²
8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	167.13	kJ/m ² K

9.0 External Walls			U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Description	Type	Construction				
Brick and Block	Cavity Wall	Other	0.24	42.22	84.96	70.60

9.1 Party Walls			U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)
Description	Type	Construction			
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs on both sides, dense blocks, cavity or cavity fill	0.00	70.00	42.94

9.2 Internal Walls			Kappa (kJ/m ² K)	Area (m ²)
Description	Construction			
GF Stud	Plasterboard on timber frame		9.00	60.00
First Floor	Plasterboard on timber frame		9.00	75.19

10.0 External Roofs			U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Description	Type	Construction				
Pitched Roof	External Plane Roof	Other	0.10	9.10	35.11	35.11

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

10.2 Internal Ceilings

Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
Internal Ceiling 1	Plasterboard ceiling, carpeted chipboard floor	9.00	35.11

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	84.00	35.11

11.2 Internal Floors

Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
Internal Floor 1	Plasterboard ceiling, carpeted chipboard floor	18.00	35.11

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	Manufacturer	Solid Door							1.10
Windows	Manufacturer	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	South							2.12	
Front Elevation	Window	[1] Brick and Block	South	None	0.00					3.43	
Side Elevation	Window	[1] Brick and Block	East	None	0.00					1.32	
Rear Elevation	Window	[1] Brick and Block	North	None	0.00					7.49	

14.0 Conservatory

None

15.0 Draught Proofing

100 %

16.0 Draught Lobby

No

17.0 Thermal Bridging

Calculate Bridges

17.1 List of Bridges

Source Type	Bridge Type	Length	Psi	Imported	Reference:
Independently assessed	E2 Other lintels (including other steel lintels)	1.26	0.098	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	3.76	0.053	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	3.60	0.043	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	1.51	0.060	No	Birtley Supatherm
Independently assessed	E3 Sill	7.61	0.034	No	CD0027
Independently assessed	E4 Jamb	27.30	0.039	No	CD0028
Table K1 - Approved	E5 Ground floor (normal)	16.79	0.160	No	
Independently assessed	E6 Intermediate floor within a dwelling	16.79	0.000	No	CD0029
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	16.79	0.060	No	
Independently assessed	E16 Corner (normal)	10.10	0.050	No	CD0035
Table K1 - Approved	E18 Party wall between dwellings	10.10	0.060	No	
Table K1 - Default	P1 Party wall - Ground floor	8.50	0.160	No	
Table K1 - Default	P2 Party wall - Intermediate floor within a dwelling	8.50	0.000	No	
Independently assessed	P4 Party wall - Roof (insulation at ceiling level)	8.50	0.049	No	CD0020

Y-value	0.055	W/m ² K
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18.0 Pressure Testing

Designed AP ₅₀	Yes	
Property Tested ?	5.00	m ³ /(h.m ²) @ 50 Pa
As Built AP ₅₀	Yes	
	4.27	m ³ /(h.m ²) @ 50 Pa

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather	Windows half open
Cross ventilation possible	Yes
Night Ventilation	Yes
Air change rate	4.00

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	No
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - centralised
MV Reference Number	500233
Configuration	2
Manufacturer SFP	0.30
Duct Type	Rigid
Wet Rooms	2

20.0 Fans, Open Fireplaces, Flues

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

21.0 Fixed Cooling System

No

22.0 Lighting

Internal

Total number of light fittings	10	
Total number of L.E.L. fittings	10	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted	Yes
Light and motion sensor	Yes

23.0 Electricity Tariff

Standard

24.0 Main Heating 1

Description	Database	
Percentage of Heat	Gas Combi	%
Database Ref. No.	100	
Fuel Type	17503	
Main Heating	Mains gas	
SAP Code	BGW	
In Winter	104	
In Summer	90.7	
Controls	87.0	
PCDF Controls	CBE Programmer, room thermostat and TRVs	
Delayed Start Stat	0	
Sap Code	No	
Flue Type	2106	
	Balanced	

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Fan Assisted Flue	Yes
Is MHS Pumped	Pump in heated space
Heat Emitter	Radiators
Flow Temperature	Normal (> 45°C)
Combi boiler type	Standard Combi
Combi keep hot type	Gas/Oil, time clock
25.0 Main Heating 2	None

Community Heating	None
28.0 Water Heating	HWP From main heating 1
Water Heating	Main Heating 1
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
SAP Code	901

29.0 Hot Water Cylinder	None
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32.0 Photovoltaic Unit		One Dwelling		
PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
0.62	South	30°	None Or Little	Yes

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

	Typical Cost	Typical savings per year	Ratings after improvement	
			SAP rating	Environmental Impact
Solar water heating	£4,000 - £6,000	£26	B 88	