



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 1 Oram Way
WEST END, SO30 3JW

Contact: Tobias Whiting
Abacus Energy (UK) Ltd
tobiaswhiting26@gmail.com

Report Issue Date: 15/02/2022

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0647 Plot 1	Issued on Date	15/02/2022
Assessment Reference	As Built	Prop Type Ref	D (HA/AR)
Property	1 Oram Way, WEST END, SO30 3JW		
SAP Rating	86 B	DER	15.06
Environmental	89 B	TER	19.74
CO ₂ Emissions (t/year)	0.78	% DER<TER	23.71
General Requirements Compliance	Pass	DLEE	46.62
		TLEE	55.82
		% DLEE<TLEE	16.48
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 TLEE 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)	15.06	kgCO ₂ /m ²	Pass
	-4.68 (-23.7%)	kgCO ₂ /m ²	

1b TLEE and DLEE

Target Fabric Energy Efficiency (TLEE)	55.82	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DLEE)	46.62	kWh/m ² /yr	
	-9.2 (-16.5%)	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	4.47 (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 South

3.43 m², No overhang

Windows facing West

1.32 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

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

Maximum

10.0 m³/(h.m²) @ 50 Pa

Pass

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)

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

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.



THERMAL BRIDGING

Calculation Type: New Build (As Built)

Property Reference	SAP 0647 Plot 1	Issued on Date	15/02/2022
Assessment Reference	As Built	Prop Type Ref	D (HA/AR)
Property	1 Oram Way, WEST END, SO30 3JW		

SAP Rating	86 B	DER	15.06	TER	19.74
Environmental	89 B	% DER<TER	23.71		
CO ₂ Emissions (t/year)	0.78	DFEE	46.62	TFEE	55.82
General Requirements Compliance	Pass	% DFEE<TFEE	16.48		

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

Client	Foreman Homes, FORE
--------	---------------------

	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.053	10.13	0.54	CD0025
External wall	E3 Sill	Independently assessed	0.034	7.60	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)	Independently assessed	0.012	16.79	0.20	CD0033
External wall	E16 Corner (normal)	Independently assessed	0.050	10.10	0.51	CD0035
External wall	E18 Party wall between dwellings	Independently assessed	0.073	10.10	0.74	CD0037
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: **7.77** W/mK:
Y-Value: **0.050** W/m²K:

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

Property Reference	SAP 0647 Plot 1			Issued on Date	15/02/2022
Assessment Reference	As Built	Prop Type Ref	D (HA/AR)		
Property	1 Oram Way, WEST END, SO30 3JW				
SAP Rating	86 B	DER	15.06	TER	19.74
Environmental	89 B	% DER<TER	23.71		
CO ₂ Emissions (t/year)	0.78	DFEE	46.62	TFEE	55.82
General Requirements Compliance	Pass	% DFEE<TFEE	16.48		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.com			Assessor ID	E477-0001
Client	Foreman Homes, FORE				

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) 15.06 kgCO₂/m²OK

1b TFEE and DFEE

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

Dwelling Fabric Energy Efficiency (DFEE)46.6 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: 4.47 (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 South: 3.43 m², No overhang

Windows facing West: 1.32 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 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												4.4700
Infiltration rate												0.2235 (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) =	0.2067 (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												
	0.2636	0.2584	0.2533	0.2274	0.2222	0.1964	0.1964	0.1912	0.2067	0.2222	0.2326	0.2429 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5136	0.5084	0.5033	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			42.9200	0.0000	0.0000	70.0000	3004.4000 (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) =	11734.5430 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							167.1111 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.7667 (36)
Total fabric heat loss						(33) + (36) =	48.7821 (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	30.1101	29.8071	29.5041	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133 (38)
Heat transfer coeff	78.8922	78.5892	78.2862	78.0955	78.0955	78.0955	78.0955	78.0955	78.0955	78.0955	78.0955	78.0955 (39)
Average = Sum(39)m / 12 =												78.2189 (39)
HLP	1.1235	1.1192	1.1149	1.1122	1.1122	1.1122	1.1122	1.1122	1.1122	1.1122	1.1122	1.1122 (40)
HLP (average)												1.1139 (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 DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 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)
Output from w/h								Solar input (sum of months) = Sum(63)m =				0.0000 (63)
	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								Total per year (kWh/year) = Sum(64)m =				1746.1553 (64)
	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
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	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)
Appliances gains (calculated in Appendix L, equation L13 or L13a), 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)
Cooking gains (calculated in Appendix L, equation L15 or L15a), 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)
Pumps, fans	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)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (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)
Total internal gains	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)
	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)

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)			
South				3.4300	46.7521	0.6300	0.7000	0.7700	49.0080 (78)			
West				1.3200	19.6403	0.6300	0.7000	0.7700	7.9231 (80)			
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	431.3643	490.3670	542.5061	595.5237	632.7274	621.8858	592.1636	552.9780	510.9363	459.8640	420.6231	409.0030 (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	41.3171	41.4764	41.6369	41.7386	41.7386	41.7386	41.7386	41.7386	41.7386	41.7386	41.7386	41.7386
util living area	3.7545	3.7651	3.7758	3.7826	3.7826	3.7826	3.7826	3.7826	3.7826	3.7826	3.7826	3.7826
	0.9898	0.9825	0.9669	0.9275	0.8417	0.6972	0.5467	0.5986	0.8114	0.9460	0.9828	0.9916 (86)
MIT	19.3752	19.5690	19.8836	20.2817	20.6455	20.8789	20.9636	20.9484	20.7726	20.3099	19.7703	19.3416 (87)
Th 2	19.9817	19.9852	19.9887	19.9909	19.9909	19.9909	19.9909	19.9909	19.9909	19.9909	19.9909	19.9909 (88)
util rest of house	0.9874	0.9786	0.9590	0.9091	0.7999	0.6178	0.4352	0.4872	0.7476	0.9285	0.9782	0.9897 (89)
MIT 2	18.5017	18.6963	19.0092	19.3967	19.7323	19.9236	19.9779	19.9707	19.8480	19.4303	18.9018	18.4752 (90)
Living area fraction	18.6960	18.8905	19.2037	19.5936	19.9354	20.1361	20.1972	20.1882	20.0537	19.6260	19.0950	0.2224 (91)
MIT	18.6960	18.8905	19.2037	19.5936	19.9354	20.1361	20.1972	20.1882	20.0537	19.6260	19.0950	18.6679 (92)
Temperature adjustment												0.0000
adjusted MIT	18.6960	18.8905	19.2037	19.5936	19.9354	20.1361	20.1972	20.1882	20.0537	19.6260	19.0950	18.6679 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9835	0.9729	0.9512	0.9004	0.7973	0.6302	0.4591	0.5104	0.7521	0.9206	0.9728	0.9862 (94)
Ext temp.	424.2317	477.0905	516.0310	536.1990	504.4860	391.9265	271.8709	282.2482	384.2740	423.3545	409.1616	403.3710 (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	1135.7308	1099.4990	994.5231	835.1212	643.1510	432.3445	280.9215	295.8427	464.9569	704.8890	936.7550	1129.8799 (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	529.3553	418.2585	355.9981	215.2239	103.1668	0.0000	0.0000	0.0000	0.0000	209.4616	379.8673	540.5226 (98)
Space heating per m2												2751.8541 (98)
										(98) / (4) =		39.1890 (99)

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	3034.0177 (211)											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	529.3553	418.2585	355.9981	215.2239	103.1668	0.0000	0.0000	0.0000	0.0000	209.4616	379.8673	540.5226 (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)	583.6332	461.1450	392.5006	237.2921	113.7451	0.0000	0.0000	0.0000	0.0000	230.9390	418.8173	595.9455 (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	89.7548	89.6773	89.5183	89.1880	88.5381	87.0000	87.0000	87.0000	87.0000	89.1306	89.5823	87.0000 (216)
Fuel for water heating, kWh/month	194.1165	170.9006	179.0072	159.9609	157.1017	141.6852	134.9651	149.6342	149.8566	166.0392	176.0621	189.0104 (219)
Water heating fuel used	1968.3396 (219)											
Annual totals kWh/year												
Space heating fuel - main system	3034.0177 (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 * 1068 * 1.00) =	-529.7630											
Total delivered energy for all uses	4958.4161 (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	3034.0177	0.2160	655.3478 (261)	
Space heating - secondary	0.0000	0.0000	0.0000 (263)	
Water heating (other fuel)	1968.3396	0.2160	425.1614 (264)	
Space and water heating			1080.5092 (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	-529.7630	0.5190	-274.9470 (269)	
Total CO2, kg/year			1057.7037 (272)	
Dwelling Carbon Dioxide Emission Rate (DER)			15.0600 (273)	

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

DER	15.0600	ZC1
Total Floor Area	70.2200	TFA
Assumed number of occupants	2.2515	N
CO2 emission factor in Table 12 for electricity displaced from grid	0.5190	EF
CO2 emissions from appliances, equation (L14)	16.6930	ZC2
CO2 emissions from cooking, equation (L16)	2.4642	ZC3
Total CO2 emissions	34.2172	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	34.2172	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)							9.1603 (36)					
Total fabric heat loss						(33) + (36) =	49.3442 (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	85.8110	85.5332	85.2609	83.9821	83.7428	82.6289	82.6289	82.4226	83.0580	83.7428	84.2268	84.7329 (39)
Average = Sum(39)m / 12 =												83.9809 (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												
Water storage loss:	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)
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)			
South				3.4300	46.7521	0.6300	0.7000	0.7700	49.0080 (78)			
West				1.3200	19.6403	0.6300	0.7000	0.7700	7.9231 (80)			
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	56.8271	57.0116	57.1937	58.0647	58.2306	59.0155	59.0155	59.1632	58.7107	58.2306	57.8959	57.5501	
alpha	4.7885	4.8008	4.8129	4.8710	4.8820	4.9344	4.9344	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	20.0103	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	0.6632	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	19.8868	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	18.9493	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	18.9493	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	568.0649	547.0071	425.1683	289.9330	302.2044	418.1080	446.4235	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	1218.2157	1180.3163	1068.9433	890.2003	685.9763	455.9127	294.6359	310.0560	492.3818	748.6760	998.0249	1209.6156	(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	582.4841	463.0196	396.1619	231.9375	103.3931	0.0000	0.0000	0.0000	0.0000	224.8758	414.6442	592.3215	(98)
Space heating												3008.8377	(98)
Space heating per m2												42.8487	(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													3221.4537 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	582.4841	463.0196	396.1619	231.9375	103.3931	0.0000	0.0000	0.0000	0.0000	224.8758	414.6442	592.3215	(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)	623.6446	495.7384	424.1562	248.3270	110.6992	0.0000	0.0000	0.0000	0.0000	240.7664	443.9446	634.1772	(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	84.1360	80.3000	80.3000	80.3000	80.3000	85.8706	87.1674	80.3000	(216)
Fuel for water heating, kWh/month	219.1998	191.8972	200.6259	179.9811	178.2492	164.4916	157.5955	175.6820	177.6222	189.1373	198.8967	213.8569	(219)
Water heating fuel used												2247.2354	(219)
Annual totals kWh/year													
Space heating fuel - main system												3221.4537	(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												5863.4795	(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	3221.4537	0.2160	695.8340 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2247.2354	0.2160	485.4029 (264)
Space and water heating			1181.2368 (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			1386.1331 (272)
Emissions per m2 for space and water heating			16.8219 (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) = (16.8219 * 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					4.4700
Infiltration rate					0.3924 (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) =	0.3629 (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	0.4627	0.4537	0.4446	0.3992	0.3902	0.3448	0.3448	0.3357	0.3629	0.3902	0.4083	0.4265 (22b)
Effective ac	0.6071	0.6029	0.5988	0.5797	0.5761	0.5594	0.5594	0.5564	0.5659	0.5761	0.5834	0.5909 (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			42.9200	0.0000	0.0000	70.0000	3004.4000 (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) (28)...(30) + (32) + (32a)...(32e) = 11418.5530 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 162.6111 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.7667 (36)
Total fabric heat loss (33) + (36) = 48.7821 (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	35.5903	35.3466	35.1076	33.9855	33.7755	32.7981	32.7981	32.6171	33.1746	33.7755	34.2003	34.6443 (38)
Heat transfer coeff	84.3724	84.1287	83.8898	82.7676	82.5576	81.5803	81.5803	81.3993	81.9567	82.5576	82.9824	83.4264 (39)
Average = Sum(39)m / 12 =												82.7666 (39)
HLP	1.2015	1.1981	1.1947	1.1787	1.1757	1.1618	1.1618	1.1592	1.1671	1.1757	1.1817	1.1881 (40)
HLP (average)												1.1787 (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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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)
South			3.4300		46.7521		0.6300		0.7000		0.7700		49.0080 (78)
West			1.3200		19.6403		0.6300		0.7000		0.7700		7.9231 (80)
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	37.5931	37.7020	37.8094	38.3220	38.4195	38.8797	38.8797	38.9662	38.7012	38.4195	38.2228	38.0194	
alpha	3.5062	3.5135	3.5206	3.5548	3.5613	3.5920	3.5920	3.5977	3.5801	3.5613	3.5482	3.5346	
util living area	0.9917	0.9856	0.9725	0.9390	0.8646	0.7300	0.5836	0.6376	0.8402	0.9563	0.9862	0.9932	(86)
MIT	19.1436	19.3447	19.6802	20.1329	20.5457	20.8355	20.9459	20.9251	20.7027	20.1741	19.5829	19.1127	(87)
Th 2	19.9188	19.9215	19.9243	19.9371	19.9395	19.9507	19.9507	19.9528	19.9464	19.9395	19.9346	19.9296	(88)
util rest of house	0.9897	0.9822	0.9657	0.9227	0.8259	0.6506	0.4649	0.5211	0.7803	0.9415	0.9824	0.9916	(89)
MIT 2	18.2274	18.4291	18.7631	19.2146	19.6031	19.8571	19.9308	19.9226	19.7550	19.2628	18.6770	18.2047	(90)
Living area fraction	18.4312	18.6328	18.9671	19.4189	19.8128	20.0748	20.1566	20.1456	19.9658	19.4655	18.8785	18.4067	(91)
Temperature adjustment	18.4312	18.6328	18.9671	19.4189	19.8128	20.0748	20.1566	20.1456	19.9658	19.4655	18.8785	18.4067	(92)
adjusted MIT	18.4312	18.6328	18.9671	19.4189	19.8128	20.0748	20.1566	20.1456	19.9658	19.4655	18.8785	18.4067	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9860	0.9768	0.9579	0.9129	0.8205	0.6610	0.4898	0.5444	0.7816	0.9329	0.9773	0.9884	(94)
Ext temp.	389.2913	443.9911	486.8064	514.2536	493.8038	391.9031	276.6185	285.0320	375.7900	398.8727	377.1250	368.8529	(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	1192.2817	1155.3207	1045.8599	870.6215	669.7720	446.6330	290.1499	304.8883	480.7445	731.9153	977.4060	1185.2120	(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	597.4248	478.0135	415.9358	256.5849	130.9204	0.0000	0.0000	0.0000	0.0000	247.7837	432.2023	607.3711	(98)
Space heating per m2												3166.2366	(98)
												45.0902	(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	766.8545	603.6940	618.6345	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7873	0.8550	0.8258	0.0000	0.0000	0.0000	0.0000	(101)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	603.7171	516.1587	510.8916	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	124.6536	168.2571	137.3596	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												430.2703 (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	31.1634	42.0643	34.3399	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												107.5676 (107)
Space cooling per m2												1.5319 (108)
Energy for space heating												45.0902 (99)
Energy for space cooling												1.5319 (108)
Total												46.6221 (109)
Dwelling Fabric Energy Efficiency (DFEE)												46.6 (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 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)													9.1603		(36)			
Total fabric heat loss													(33) + (36) =		49.3442		(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	36.4668	36.1890	35.9168	34.6379	34.3986	33.2847	33.2847	33.0785	33.7138	34.3986	34.8827	35.3887	(38)					
	85.8110	85.5332	85.2609	83.9821	83.7428	82.6289	82.6289	82.4226	83.0580	83.7428	84.2268	84.7329	(39)					
Average = Sum(39)m / 12 =												83.9809	(39)					
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec						
HLP (average)	1.2220	1.2181	1.2142	1.1960	1.1926	1.1767	1.1767	1.1738	1.1828	1.1926	1.1995	1.2067	(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
	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)
South	3.4300											49.0080 (78)
West	1.3200											7.9231 (80)

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, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nilm (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	56.8271	57.0116	57.1937	58.0647	58.2306	59.0155	59.0155	59.1632	58.7107	58.2306	57.8959	57.5501
alpha	4.7885	4.8008	4.8129	4.8710	4.8820	4.9344	4.9344	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	19.0616	19.4150	19.7153	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	20.1616	20.0424	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	20.1616	20.0424	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	540.4353	530.3096	419.6918	288.8284	300.1155	404.6298	415.7838	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	1250.4065	1208.0649	1089.4148	901.0958	689.5463	456.3086	294.6327	310.0373	493.5597	758.4057	1020.1441	1242.1515 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	637.3704	508.1147	437.6154	259.6755	118.4721	0.0000	0.0000	0.0000	0.0000	254.9107	458.2030	647.0950 (98)
Space heating												3321.4567 (98)
Space heating per m2										(98) / (4) =		47.3007 (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	776.7118	611.4540	626.4121	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	645.8844	550.8960	546.3113	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	94.2932	142.4125	111.0073	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												347.7130 (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	23.5733	35.6031	27.7518	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												86.9282 (107)
Space cooling per m2												1.2379 (108)
Energy for space heating												47.3007 (99)
Energy for space cooling												1.2379 (108)
Total												48.5387 (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	=	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												4.4700
Infiltration rate												0.2235 (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) =	0.2067 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	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												
	0.2429	0.2274	0.2274	0.2067	0.2119	0.2016	0.2016	0.1964	0.1964	0.2119	0.2067	0.2119 (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			42.9200	0.0000	0.0000	70.0000	3004.4000 (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) =	11734.5430 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							167.1111 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.7667 (36)
Total fabric heat loss						(33) + (36) =	48.7821 (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	78.0955	78.0955	78.0955	78.0955	78.0955	78.0955	78.0955	78.0955	78.0955	78.0955	78.0955	78.0955 (39)
Average = Sum(39)m / 12 =												78.0955 (39)
HLP	1.1122	1.1122	1.1122	1.1122	1.1122	1.1122	1.1122	1.1122	1.1122	1.1122	1.1122	1.1122 (40)
HLP (average)												1.1122 (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	1379.4225 (45)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
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)	
South				3.4300	56.5862	0.6300	0.7000		0.7700		59.3166 (78)	
West				1.3200	25.1733	0.6300	0.7000		0.7700		10.1551 (80)	
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	41.7386	41.7386	41.7386	41.7386	41.7386	41.7386	41.7386	41.7386	41.7386	41.7386	41.7386	41.7386
alpha	3.7826	3.7826	3.7826	3.7826	3.7826	3.7826	3.7826	3.7826	3.7826	3.7826	3.7826	3.7826
util living area	0.9599	0.9468	0.9109	0.8301	0.6907	0.4801	0.3406	0.3435	0.5983	0.8314	0.9323	0.9654 (86)
MIT	19.8779	19.9995	20.2752	20.6070	20.8553	20.9727	20.9945	20.9945	20.9373	20.6772	20.2434	19.8394 (87)
Th 2	19.9909	19.9909	19.9909	19.9909	19.9909	19.9909	19.9909	19.9909	19.9909	19.9909	19.9909	19.9909 (88)
util rest of house	0.9512	0.9355	0.8917	0.7939	0.6275	0.3925	0.2384	0.2373	0.5081	0.7861	0.9152	0.9576 (89)
MIT 2	19.0032	19.1209	19.3853	19.6912	19.9002	19.9798	19.9898	19.9899	19.9612	19.7605	19.3600	18.9663 (90)
Living area fraction									fLA = Living area / (4) =			0.2224 (91)
MIT	19.1978	19.3164	19.5832	19.8949	20.1127	20.2007	20.2133	20.2133	20.1784	19.9644	19.5565	19.1605 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1978	19.3164	19.5832	19.8949	20.1127	20.2007	20.2133	20.2133	20.1784	19.9644	19.5565	19.1605 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9427	0.9263	0.8826	0.7900	0.6356	0.4112	0.2612	0.2610	0.5258	0.7847	0.9064	0.9496 (94)
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	1061.9269	1039.9491	935.8373	764.9399	547.6583	335.8641	196.2763	188.4709	373.1681	614.1774	855.6531	1051.2050 (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	359.4202	288.2075	227.3968	114.6660	39.2199	0.0000	0.0000	0.0000	0.0000	92.7657	227.6498	371.8543 (98)
Space heating												1721.1802 (98)
RHI space heating demand												1721 (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 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												4.4700
Infiltration rate												0.2235 (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) =	0.2067 (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												
	0.2636	0.2584	0.2533	0.2274	0.2222	0.1964	0.1964	0.1912	0.2067	0.2222	0.2326	0.2429 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5136	0.5084	0.5033	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			42.9200	0.0000	0.0000	70.0000	3004.4000 (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) =	11734.5430 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							167.1111 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.7667 (36)
Total fabric heat loss						(33) + (36) =	48.7821 (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	30.1101	29.8071	29.5041	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133 (38)
Heat transfer coeff	78.8922	78.5892	78.2862	78.0955	78.0955	78.0955	78.0955	78.0955	78.0955	78.0955	78.0955	78.0955 (39)
Average = Sum(39)m / 12 =												78.2189 (39)
HLP	1.1235	1.1192	1.1149	1.1122	1.1122	1.1122	1.1122	1.1122	1.1122	1.1122	1.1122	1.1122 (40)
HLP (average)												1.1139 (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	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)
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	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	10.6334	0.6300	0.7000	0.7700	24.3403 (74)			
South				3.4300	46.7521	0.6300	0.7000	0.7700	49.0080 (78)			
West				1.3200	19.6403	0.6300	0.7000	0.7700	7.9231 (80)			
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	41.3171	41.4764	41.6369	41.7386	41.7386	41.7386	41.7386	41.7386	41.7386	41.7386	41.7386	41.7386 (86)
alpha	3.7545	3.7651	3.7758	3.7826	3.7826	3.7826	3.7826	3.7826	3.7826	3.7826	3.7826	3.7826 (86)
util living area	0.9716	0.9583	0.9322	0.8753	0.7691	0.6121	0.4650	0.5068	0.7167	0.8909	0.9559	0.9755 (86)
MIT	19.6510	19.8301	20.1125	20.4559	20.7497	20.9226	20.9789	20.9705	20.8561	20.4939	20.0152	19.6152 (87)
Th 2	19.9817	19.9852	19.9887	19.9909	19.9909	19.9909	19.9909	19.9909	19.9909	19.9909	19.9909	19.9909 (88)
util rest of house	0.9657	0.9497	0.9179	0.8483	0.7196	0.5333	0.3653	0.4054	0.6443	0.8615	0.9453	0.9704 (89)
MIT 2	18.7728	18.9508	19.2278	19.5544	19.8155	19.9499	19.9837	19.9800	19.9061	19.5966	19.1392	18.7450 (90)
Living area fraction	18.9682	19.1464	19.4246	19.7550	20.0233	20.1663	20.2051	20.2004	20.1174	19.7962	19.3341	18.9385 (92)
MIT	18.9682	19.1464	19.4246	19.7550	20.0233	20.1663	20.2051	20.2004	20.1174	19.7962	19.3341	18.9385 (93)
Temperature adjustment												0.0000
adjusted MIT	18.9682	19.1464	19.4246	19.7550	20.0233	20.1663	20.2051	20.2004	20.1174	19.7962	19.3341	18.9385 (93)

8. Space heating requirement

Utilisation	0.9583	0.9410	0.9084	0.8411	0.7214	0.5477	0.3871	0.4273	0.6542	0.8549	0.9368	0.9635 (94)
Useful gains	570.1376	613.4751	633.1660	622.2637	552.9155	409.3980	276.4379	289.2817	420.0180	513.9084	536.3278	548.3166 (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	1157.2033	1119.6122	1011.8154	847.7245	650.0109	434.7021	281.5400	296.7914	469.9304	718.1831	955.4261	1151.0136 (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	436.7768	340.1241	281.7151	162.3318	72.2390	0.0000	0.0000	0.0000	0.0000	151.9804	301.7508	448.4066 (98)
Space heating												2195.3245 (98)
Space heating per m2												31.2635 (99)

FULL SAP CALCULATION PRINTOUT

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												2420.4239	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	436.7768	340.1241	281.7151	162.3318	72.2390	0.0000	0.0000	0.0000	0.0000	151.9804	301.7508	448.4066	(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)	481.5621	374.9991	310.6010	178.9766	79.6460	0.0000	0.0000	0.0000	0.0000	167.5638	332.6910	494.3843	(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	89.6133	89.5174	89.3227	88.9309	88.2303	87.0000	87.0000	87.0000	87.0000	88.8361	89.3950	89.6532	(216)
(217)m	89.6133	89.5174	89.3227	88.9309	88.2303	87.0000	87.0000	87.0000	87.0000	88.8361	89.3950	89.6532	(217)
Fuel for water heating, kWh/month	194.4230	171.2058	179.3992	160.4233	157.6497	141.6852	134.9651	149.6342	149.8566	166.5898	176.4310	189.2937	(219)
Water heating fuel used												1971.5565	(219)
Annual totals kWh/year													
Space heating fuel - main system												2420.4239	(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 * 1068 * 1.00) =										-529.7630		-529.7630	(233)
Total delivered energy for all uses												4348.0392	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2420.4239	3.4800	84.2308 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1971.5565	3.4800	68.6102 (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	-529.7630	13.1900	-69.8757 (252)
Total energy cost			267.0451 (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] =	0.9734 (257)
SAP value	86.4206	
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	2420.4239	0.2160	522.8116 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1971.5565	0.2160	425.8562 (264)
Space and water heating			948.6678 (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	-529.7630	0.5190	-274.9470 (269)
Total kg/year			925.8623 (272)
CO2 emissions per m2			13.1900 (273)
EI value			89.2323
EI rating			89
EI band			B

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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	$3.48 / 0.8846 = 3.934$, stars = 4
Water heating environmental impact	$0.216 / 0.8846 = 0.2442$, 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	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												4.4700
Infiltration rate												0.2235 (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) =	0.2067 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	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												
	0.2429	0.2274	0.2274	0.2067	0.2119	0.2016	0.2016	0.1964	0.1964	0.2119	0.2067	0.2119 (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			42.9200	0.0000	0.0000	70.0000	3004.4000 (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) =	11734.5430 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							167.1111 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.7667 (36)
Total fabric heat loss						(33) + (36) =	48.7821 (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	78.0955	78.0955	78.0955	78.0955	78.0955	78.0955	78.0955	78.0955	78.0955	78.0955	78.0955	78.0955 (39)
Average = Sum(39)m / 12 =												78.0955 (39)
HLP	1.1122	1.1122	1.1122	1.1122	1.1122	1.1122	1.1122	1.1122	1.1122	1.1122	1.1122	1.1122 (40)
HLP (average)												1.1122 (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 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)
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)
										Solar input (sum of months) = Sum(63)m =		0.0000 (63)
										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
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	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)
Appliances gains (calculated in Appendix L, equation L13 or L13a), 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)
Cooking gains (calculated in Appendix L, equation L15 or L15a), 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)
Pumps, fans	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)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (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)
Total internal gains	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)
	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)	
South				3.4300	56.5862	0.6300	0.7000	0.7700	59.3166 (78)	
West				1.3200	25.1733	0.6300	0.7000	0.7700	10.1551 (80)	

Solar gains	100.3015	150.0403	223.7650	306.5532	349.2470	396.8048	362.2780	325.3717	263.2108	182.9298
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
alpha	41.7386	41.7386	41.7386	41.7386	41.7386	41.7386	41.7386	41.7386	41.7386	41.7386	41.7386	41.7386
util living area	3.7826	3.7826	3.7826	3.7826	3.7826	3.7826	3.7826	3.7826	3.7826	3.7826	3.7826	3.7826
	0.9599	0.9468	0.9109	0.8301	0.6907	0.4801	0.3406	0.3435	0.5983	0.8314	0.9323	0.9654 (86)
MIT	19.8779	19.9995	20.2752	20.6070	20.8553	20.9727	20.9945	20.9945	20.9373	20.6772	20.2434	19.8394 (87)
Th 2	19.9909	19.9909	19.9909	19.9909	19.9909	19.9909	19.9909	19.9909	19.9909	19.9909	19.9909	19.9909 (88)
util rest of house	0.9512	0.9355	0.8917	0.7939	0.6275	0.3925	0.2384	0.2373	0.5081	0.7861	0.9152	0.9576 (89)
MIT 2	19.0032	19.1209	19.3853	19.6912	19.9002	19.9798	19.9898	19.9899	19.9612	19.7605	19.3600	18.9663 (90)
Living area fraction									fLA = Living area / (4) =			0.2224 (91)
MIT	19.1978	19.3164	19.5832	19.8949	20.1127	20.2007	20.2133	20.2133	20.1784	19.9644	19.5565	19.1605 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1978	19.3164	19.5832	19.8949	20.1127	20.2007	20.2133	20.2133	20.1784	19.9644	19.5565	19.1605 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9427	0.9263	0.8826	0.7900	0.6356	0.4112	0.2612	0.2610	0.5258	0.7847	0.9064	0.9496 (94)
Ext temp.	578.8353	611.0688	630.1965	605.6815	494.9434	328.3952	195.3561	187.5895	354.2300	489.4923	539.4729	551.4008 (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	1061.9269	1039.9491	935.8373	764.9399	547.6583	335.8641	196.2763	188.4709	373.1681	614.1774	855.6531	1051.2050 (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	359.4202	288.2075	227.3968	114.6660	39.2199	0.0000	0.0000	0.0000	0.0000	92.7657	227.6498	371.8543 (98)
Space heating per m2												1721.1802 (98)
										(98) / (4) =		24.5113 (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													1897.6629 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	359.4202	288.2075	227.3968	114.6660	39.2199	0.0000	0.0000	0.0000	0.0000	92.7657	227.6498	371.8543	(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)	396.2736	317.7591	250.7131	126.4234	43.2413	0.0000	0.0000	0.0000	0.0000	102.2776	250.9920	409.9827	(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													
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	89.4579	89.3804	89.1330	88.6107	87.7877	87.0000	87.0000	87.0000	87.0000	88.3893	89.1483	89.5071	(216)
(217)m													(217)
Fuel for water heating, kWh/month	194.7607	171.4683	179.7809	161.0029	158.4446	141.6852	134.9651	149.6342	149.8566	167.4318	176.9191	189.6026	(219)
Water heating fuel used												1975.5520	(219)
Annual totals kWh/year													
Space heating fuel - main system												1897.6629	(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 * 1184 * 1.00) =										-587.2228		-587.2228	(233)
Total delivered energy for all uses												3771.8137	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1897.6629	3.6300	68.8852 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1975.5520	3.6300	71.7125 (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	-587.2228	19.4400	-114.1561 (252)
Total energy cost			215.8853 (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	1897.6629	0.2160	409.8952 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1975.5520	0.2160	426.7192 (264)
Space and water heating			836.6144 (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	-587.2228	0.5190	-304.7686 (269)
Total kg/year			783.9872 (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	1897.6629	1.2200	2315.1487 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1975.5520	1.2200	2410.1734 (264)
Space and water heating			4725.3221 (265)
Pumps and fans	166.0312	3.0700	509.7159 (267)
Energy for lighting	319.7904	3.0700	981.7567 (268)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Energy saving/generation technologies			
PV Unit	-587.2228	3.0700	-1802.7740 (269)
Primary energy kWh/year			4414.0207 (272)
Primary energy kWh/m2/year			62.8599 (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 (23.5%)

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	£236	£200	£35
Space heating	£196	£196	£0
Water heating	£72	£46	£26
Lighting	£62	£62	£0
Generated (PV)	-£114	-£114	£0
Total cost of fuels	£216	£190	£25
Total cost of uses	£216	£190	£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												4.4700
Infiltration rate												0.2235 (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) =	0.2067 (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												
	0.2636	0.2584	0.2533	0.2274	0.2222	0.1964	0.1964	0.1912	0.2067	0.2222	0.2326	0.2429 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5136	0.5084	0.5033	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			42.9200	0.0000	0.0000	70.0000	3004.4000 (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) =	11734.5430 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							167.1111 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.7667 (36)
Total fabric heat loss						(33) + (36) =	48.7821 (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	30.1101	29.8071	29.5041	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133 (38)
Heat transfer coeff	78.8922	78.5892	78.2862	78.0955	78.0955	78.0955	78.0955	78.0955	78.0955	78.0955	78.0955	78.0955 (39)
Average = Sum(39)m / 12 =												78.2189 (39)
HLP	1.1235	1.1192	1.1149	1.1122	1.1122	1.1122	1.1122	1.1122	1.1122	1.1122	1.1122	1.1122 (40)
HLP (average)												1.1139 (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)
South	3.4300	46.7521	0.6300		0.7000	0.7700	49.0080	(78)
West	1.3200	19.6403	0.6300		0.7000	0.7700	7.9231	(80)

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	41.3171	41.4764	41.6369	41.7386	41.7386	41.7386	41.7386	41.7386	41.7386	41.7386	41.7386	41.7386	
alpha	3.7545	3.7651	3.7758	3.7826	3.7826	3.7826	3.7826	3.7826	3.7826	3.7826	3.7826	3.7826	
util living area	0.9716	0.9583	0.9322	0.8753	0.7691	0.6121	0.4650	0.5068	0.7167	0.8909	0.9559	0.9755	(86)
MIT	19.6510	19.8301	20.1125	20.4559	20.7497	20.9226	20.9789	20.9705	20.8561	20.4939	20.0152	19.6152	(87)
Th 2	19.9817	19.9852	19.9887	19.9909	19.9909	19.9909	19.9909	19.9909	19.9909	19.9909	19.9909	19.9909	(88)
util rest of house	0.9657	0.9497	0.9179	0.8483	0.7196	0.5333	0.3653	0.4054	0.6443	0.8615	0.9453	0.9704	(89)
MIT 2	18.7728	18.9508	19.2278	19.5544	19.8155	19.9499	19.9837	19.9800	19.9061	19.5966	19.1392	18.7450	(90)
Living area fraction									fLA = Living area / (4) =			0.2224	(91)
MIT	18.9682	19.1464	19.4246	19.7550	20.0233	20.1663	20.2051	20.2004	20.1174	19.7962	19.3341	18.9385	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9682	19.1464	19.4246	19.7550	20.0233	20.1663	20.2051	20.2004	20.1174	19.7962	19.3341	18.9385	(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	0.9410	0.9084	0.8411	0.7214	0.5477	0.3871	0.4273	0.6542	0.8549	0.9368	0.9635	(94)
Useful gains	570.1376	613.4751	633.1660	622.2637	552.9155	409.3980	276.4379	289.2817	420.0180	513.9084	536.3278	548.3166	(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	1157.2033	1119.6122	1011.8154	847.7245	650.0109	434.7021	281.5400	296.7914	469.9304	718.1831	955.4261	1151.0136	(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	436.7768	340.1241	281.7151	162.3318	72.2390	0.0000	0.0000	0.0000	0.0000	151.9804	301.7508	448.4066	(98)
Space heating												2195.3245	(98)
Space heating per m2											(98) / (4) =	31.2635	(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													2420.4239 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	436.7768	340.1241	281.7151	162.3318	72.2390	0.0000	0.0000	0.0000	0.0000	151.9804	301.7508	448.4066	(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)	481.5621	374.9991	310.6010	178.9766	79.6460	0.0000	0.0000	0.0000	0.0000	167.5638	332.6910	494.3843	(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	89.7228	89.7454	89.7570	89.7766	89.6676	87.0000	87.0000	87.0000	87.0000	89.2209	89.5568	87.0000	(216)
(217)m	89.7228	89.7454	89.7570	89.7766	89.6676	87.0000	87.0000	87.0000	87.0000	89.2209	89.5568	87.0000	(217)
Fuel for water heating, kWh/month	167.5921	126.4050	102.9807	57.6818	29.9092	14.8057	9.7624	40.2439	64.1820	108.8220	144.5098	166.8521	(219)
Water heating fuel used												1033.7467	(219)
Annual totals kWh/year													
Space heating fuel - main system												2420.4239	(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 * 1068 * 1.00) =										-529.7630		-529.7630	(233)
Total delivered energy for all uses												3460.2294	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2420.4239	3.4800	84.2308 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1033.7467	3.4800	35.9744 (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	-529.7630	13.1900	-69.8757 (252)
Total energy cost			241.0043 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)		0.8785 (257)
SAP value	[(255) x (256)] / [(4) + 45.0] =	87.7448
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	2420.4239	0.2160	522.8116	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1033.7467	0.2160	223.2893	(264)
Space and water heating			746.1009	(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	-529.7630	0.5190	-274.9470	(269)
Total kg/year			749.2453	(272)
CO2 emissions per m2			10.6700	(273)
EI value			91.2863	
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	=	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												4.4700
Infiltration rate												0.2235 (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) =	0.2067 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	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												
	0.2429	0.2274	0.2274	0.2067	0.2119	0.2016	0.2016	0.1964	0.1964	0.2119	0.2067	0.2119 (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			42.9200	0.0000	0.0000	70.0000	3004.4000 (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) =	11734.5430 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							167.1111 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.7667 (36)
Total fabric heat loss						(33) + (36) =	48.7821 (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	78.0955	78.0955	78.0955	78.0955	78.0955	78.0955	78.0955	78.0955	78.0955	78.0955	78.0955	78.0955 (39)
Average = Sum(39)m / 12 =												78.0955 (39)
HLP	1.1122	1.1122	1.1122	1.1122	1.1122	1.1122	1.1122	1.1122	1.1122	1.1122	1.1122	1.1122 (40)
HLP (average)												1.1122 (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										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												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	Specific data or Table 6b	g	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.4900	13.4684	0.6300		0.7000	0.7700	80.8298	(74)
South	3.4300	56.5862	0.6300		0.7000	0.7700	59.3166	(78)
West	1.3200	25.1733	0.6300		0.7000	0.7700	10.1551	(80)

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	41.7386	41.7386	41.7386	41.7386	41.7386	41.7386	41.7386	41.7386	41.7386	41.7386	41.7386	41.7386	
alpha	3.7826	3.7826	3.7826	3.7826	3.7826	3.7826	3.7826	3.7826	3.7826	3.7826	3.7826	3.7826	
util living area	0.9599	0.9468	0.9109	0.8301	0.6907	0.4801	0.3406	0.3435	0.5983	0.8314	0.9323	0.9654	(86)
MIT	19.8779	19.9995	20.2752	20.6070	20.8553	20.9727	20.9945	20.9945	20.9373	20.6772	20.2434	19.8394	(87)
Th 2	19.9909	19.9909	19.9909	19.9909	19.9909	19.9909	19.9909	19.9909	19.9909	19.9909	19.9909	19.9909	(88)
util rest of house	0.9512	0.9355	0.8917	0.7939	0.6275	0.3925	0.2384	0.2373	0.5081	0.7861	0.9152	0.9576	(89)
MIT 2	19.0032	19.1209	19.3853	19.6912	19.9002	19.9798	19.9898	19.9899	19.9612	19.7605	19.3600	18.9663	(90)
Living area fraction									fLA = Living area / (4) =			0.2224	(91)
MIT	19.1978	19.3164	19.5832	19.8949	20.1127	20.2007	20.2133	20.2133	20.1784	19.9644	19.5565	19.1605	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1978	19.3164	19.5832	19.8949	20.1127	20.2007	20.2133	20.2133	20.1784	19.9644	19.5565	19.1605	(93)

FULL SAP CALCULATION PRINTOUT

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	0.9427	0.9263	0.8826	0.7900	0.6356	0.4112	0.2612	0.2610	0.5258	0.7847	0.9064	0.9496	(94)
Useful gains	578.8353	611.0688	630.1965	605.6815	494.9434	328.3952	195.3561	187.5895	354.2300	489.4923	539.4729	551.4008	(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	1061.9269	1039.9491	935.8373	764.9399	547.6583	335.8641	196.2763	188.4709	373.1681	614.1774	855.6531	1051.2050	(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	359.4202	288.2075	227.3968	114.6660	39.2199	0.0000	0.0000	0.0000	0.0000	92.7657	227.6498	371.8543	(98)
Space heating												1721.1802	(98)
Space heating per m2											(98) / (4) =	24.5113	(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													1897.6629	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	359.4202	288.2075	227.3968	114.6660	39.2199	0.0000	0.0000	0.0000	0.0000	92.7657	227.6498	371.8543	(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)	396.2736	317.7591	250.7131	126.4234	43.2413	0.0000	0.0000	0.0000	0.0000	102.2776	250.9920	409.9827	(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	89.5970	89.6217	89.6056	89.5381	89.0046	87.0000	87.0000	87.0000	87.0000	88.8051	89.3542	89.6166	(216)	
(217)m	89.5970	89.6217	89.6056	89.5381	89.0046	87.0000	87.0000	87.0000	87.0000	88.8051	89.3542	89.6166	(217)	
Fuel for water heating, kWh/month	163.4189	126.8775	102.2435	56.2323	35.7473	7.5618	7.7957	33.6680	59.0901	105.1885	139.6993	164.7990	(219)	
Water heating fuel used												1002.3218	(219)	
Annual totals kWh/year														
Space heating fuel - main system												1897.6629	(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 * 1184 * 1.00) =										-587.2228			-587.2228	(233)
Total delivered energy for all uses													2848.5836	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1897.6629	3.6300	68.8852	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1002.3218	3.6300	36.3843	(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	-587.2228	19.4400	-114.1561	(252)
Total energy cost			190.2771	(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	1897.6629	0.2160	409.8952	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1002.3218	0.2160	216.5015	(264)
Space and water heating			626.3967	(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	-587.2228	0.5190	-304.7686 (269)
Total kg/year			599.7195 (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	1897.6629	1.2200	2315.1487 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1002.3218	1.2200	1222.8326 (264)
Space and water heating			3537.9814 (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	-587.2228	3.0700	-1802.7740 (269)
Primary energy kWh/year			3380.1799 (272)
Primary energy kWh/m2/year			48.1370 (273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0647 Plot 1	Issued on Date	15/02/2022
Assessment Reference	As Built	Prop Type Ref	D (HA/AR)
Project	1 Oram Way, WEST END, SO30 3JW		
Calculation Type	New Build (As Built)		

SAP Rating	86 B	DER	15.06	TER	19.74
Environmental	89 B	% DER<TER	23.71		
CO ₂ Emissions (t/year)	0.78	DFEE	46.62	TFEE	55.82
General Requirements Compliance	Pass	% DFEE<TFEE	16.48		

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 1	Issued on Date	15/02/2022
Assessment Reference	As Built	Prop Type Ref	D (HA/AR)
Project	1 Oram Way, WEST END, SO30 3JW		
Calculation Type	New Build (As Built)		

SAP Rating	86 B	DER	15.06	TER	19.74
Environmental	89 B	% DER<TER	23.71		
CO ₂ Emissions (t/year)	0.78	DFEE	46.62	TFEE	55.82
General Requirements Compliance	Pass	% DFEE<TFEE	16.48		

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

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 1	Issued on Date	15/02/2022
Assessment Reference	As Built	Prop Type Ref	D (HA/AR)
Project	1 Oram Way, WEST END, SO30 3JW		
Calculation Type	New Build (As Built)		

SAP Rating	86 B	DER	15.06	TER	19.74
Environmental	89 B	% DER<TER	23.71		
CO ₂ Emissions (t/year)	0.78	DFEE	46.62	TFEE	55.82
General Requirements Compliance	Pass	% DFEE<TFEE	16.48		

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

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 1	Issued on Date	15/02/2022
Assessment Reference	As Built	Prop Type Ref	D (HA/AR)
Property	1 Oram Way, WEST END, SO30 3JW		
SAP Rating	86 B	DER	15.06
Environmental	89 B	TER	19.74
CO ₂ Emissions (t/year)	0.78	% DER<TER	23.71
General Requirements Compliance	Pass	DfEE	46.62
		TfEE	55.82
		% DfEE<TfEE	16.48
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	167.11	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	42.92

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/m²K)	Area (m²)
Internal Ceiling 1	Plasterboard ceiling, carpeted chipboard floor	9.00	35.11

11.0 Heat Loss Floors

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)
Ground Floor	Ground Floor - Solid	Other	0.12	84.00	35.11

11.2 Internal Floors

Description	Construction	Kappa (kJ/m²K)	Area (m²)
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/m²K)
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 (m²)	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	West	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)	10.13	0.053	No	CD0025
Independently assessed	E3 Sill	7.60	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
Independently assessed	E10 Eaves (insulation at ceiling level)	16.79	0.012	No	CD0033
Independently assessed	E16 Corner (normal)	10.10	0.050	No	CD0035
Independently assessed	E18 Party wall between dwellings	10.10	0.073	No	CD0037
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 0.050 W/m²K

18.0 Pressure Testing

Designed AP ₅₀	5.00	m³/(h.m²) @ 50 Pa
Property Tested ?	Yes	
As Built AP ₅₀	4.47	m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather Windows half open

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

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

	Database	
Description	Gas Combi	
Percentage of Heat	100	%
Database Ref. No.	17503	
Fuel Type	Mains gas	
Main Heating	BGW	
SAP Code	104	
In Winter	90.7	
In Summer	87.0	
Controls	CBE Programmer, room thermostat and TRVs	
PCDF Controls	0	
Delayed Start Stat	No	
Sap Code	2106	
Flue Type	Balanced	
Fan Assisted Flue	Yes	
Is MHS Pumped	Pump in heated space	
Heat Emitter	Radiators	

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Flow Temperature	Normal (> 45°C)
Combi boiler type	Standard Combi
Combi keep hot type	Gas/Oil, time clock
25.0 Main Heating 2	None

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

29.0 Hot Water Cylinder	None
--------------------------------	------

32.0 Photovoltaic Unit		One Dwelling		
PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
0.62	South	45°	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	