



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 8 Shaw Road, West End
Southampton, SO30 3JZ

Contact: Tobias Whiting
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Report Issue Date: 01/03/2022

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0647 Plot 72	Issued on Date	01/03/2022
Assessment Reference	As Built	Prop Type Ref	T (HA/SO/AR)
Property	8 Shaw Road, West End, Southampton, SO30 3JZ		
SAP Rating	86 B	DER	16.12
Environmental	88 B	TER	20.50
CO ₂ Emissions (t/year)	0.83	% DER<TER	21.38
General Requirements Compliance	Pass	DLEE	50.44
		TFEE	61.03
		% DLEE<TFEE	17.35
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.com		Assessor ID
			E477-0001
Client	Foreman Homes, FORE		

SUMMARY FOR INPUT DATA FOR New Build (As Built)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	20.50	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	16.12	kgCO ₂ /m ²	Pass
	-4.38 (-21.4%)	kgCO ₂ /m ²	

1b TFEE and DLEE

Target Fabric Energy Efficiency (TFEE)	61.03	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DLEE)	50.44	kWh/m ² /yr	
	-10.6 (-17.4%)	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	4.17 (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 East

6.94 m², No overhang

Windows facing West

7.60 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

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

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

Maximum

10.0 m³/(h.m²) @ 50 Pa

Pass

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BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

10 Key features

Party wall U-value	0.00	W/m ² K
Roof U-value	0.10	W/m ² K
Floor U-value	0.12	W/m ² K
Door U-value	1.10	W/m ² K
Thermal bridging ψ -value	0.026	W/m ² K
Photovoltaic array	0.76	kW

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THERMAL BRIDGING

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SAP Rating	86 B	DER	16.12	TER	20.50
Environmental	88 B	% DER<TER	21.38		
CO ₂ Emissions (t/year)	0.83	DFEE	50.44	TFEE	61.03
General Requirements Compliance	Pass	% DFEE<TFEE	17.35		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.com	Assessor ID	E477-0001
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Client	Foreman Homes, FORE
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	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.053	1.92	0.10	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.043	6.64	0.29	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.043	3.02	0.13	Birtley Supatherm
External wall	E3 Sill	Independently assessed	0.034	7.55	0.26	CD0027
External wall	E4 Jamb	Independently assessed	0.039	25.50	0.99	CD0028
External wall	E5 Ground floor (normal)	Independently assessed	0.037	24.57	0.91	Knauf P7
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.000	24.57	0.00	CD0029
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	15.82	0.95	
External wall	E12 Gable (insulation at ceiling level)	Independently assessed	0.054	8.93	0.48	CD0031
External wall	E16 Corner (normal)	Independently assessed	0.050	20.20	1.01	CD0035

Total: **5.12** W/mK:
Y-Value: **0.026** W/m²K:

FULL SAP CALCULATION PRINTOUT

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

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

DWELLING AS BUILT

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) 20.50 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 16.12 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)61.0 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)50.4 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:	4.17 (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 East:	6.94 m ² , No overhang
Windows facing West:	7.60 m ² , No overhang
Air change rate:	4.00 ach
Blinds/curtains:	None

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
Thermal bridging y-value	0.026 W/m ² K
Photovoltaic array	0.76 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	34.9000 (1b)	x 2.3900 (2b)	= 83.4110 (1b) - (3b)
First floor	34.9000 (1c)	x 2.6700 (2c)	= 93.1830 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	176.5940 (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												4.1700
Infiltration rate												0.2085 (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) =	0.1929 (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												
	0.2459	0.2411	0.2363	0.2121	0.2073	0.1832	0.1832	0.1784	0.1929	0.2073	0.2170	0.2266 (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)			14.5400	1.1450	16.6489		(27)
Ground Floor			34.9000	0.1200	4.1880	84.0000	2931.6000 (28a)
Brick and Block	124.3200	16.6600	107.6600	0.2400	25.8384	42.2200	4545.4052 (29a)
Pitched Roof	34.9000		34.9000	0.1000	3.4900	9.1000	317.5900 (30)
Total net area of external elements Aum(A, m ²)			194.1200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	52.4973		(33)
GF Stud			18.5500			9.0000	166.9500 (32c)
First Floor			66.1200			9.0000	595.0800 (32c)
GF Block			42.6000			75.0000	3195.0000 (32c)
Internal Floor 1			34.9000			18.0000	628.2000 (32d)
Internal Ceiling 1			34.9000			18.0000	628.2000 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 13008.0252 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							186.3614 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.1189 (36)
Total fabric heat loss						(33) + (36) =	57.6161 (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	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380 (38)
Heat transfer coeff	86.7541	86.7541	86.7541	86.7541	86.7541	86.7541	86.7541	86.7541	86.7541	86.7541	86.7541	86.7541 (39)
Average = Sum(39)m / 12 =												86.7541 (39)
HLP	1.2429	1.2429	1.2429	1.2429	1.2429	1.2429	1.2429	1.2429	1.2429	1.2429	1.2429	1.2429 (40)
HLP (average)												1.2429 (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	2.2413 (42)
Average daily hot water use (litres/day)	87.4299 (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	96.1729	92.6757	89.1785	85.6813	82.1841	78.6869	78.6869	82.1841	85.6813	89.1785	92.6757	96.1729 (44)
142.6216	124.7378	128.7182	112.2197	107.6774	92.9175	86.1017	86.1017	98.8029	99.9830	116.5205	127.1912	138.1214 (45)
Energy content (annual)										Total = Sum (45)m =		1375.6130 (45)
Distribution loss (46)m = 0.15 x (45)m												
21.3932	18.7107	19.3077	16.8330	16.1516	13.9376	12.9153	14.8204	14.9974	17.4781	19.0787	20.7182	(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	31.2107	28.1746	31.1682	30.1344	31.1182	30.0906	31.0788	31.1044	30.1145	31.1475	30.1757	31.2025 (61)
Total heat required for water heating calculated for each month												
173.8323	152.9124	159.8864	142.3541	138.7957	123.0081	117.1805	129.9073	130.0974	147.6680	157.3669	169.3239	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum (63)m =												0.0000 (63)
Output from w/h												
173.8323	152.9124	159.8864	142.3541	138.7957	123.0081	117.1805	129.9073	130.0974	147.6680	157.3669	169.3239	(64)
Heat gains from water heating, kWh/month												
55.2244	48.5190	50.5909	44.8466	43.5823	38.4177	36.3985	40.6281	40.7729	46.5299	49.8350	53.7260	(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
112.0630	112.0630	112.0630	112.0630	112.0630	112.0630	112.0630	112.0630	112.0630	112.0630	112.0630	112.0630	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
17.6061	15.6376	12.7173	9.6278	7.1969	6.0759	6.5653	8.5338	11.4540	14.5435	16.9744	18.0954	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
196.8298	198.8723	193.7253	182.7680	168.9364	155.9366	147.2520	145.2095	150.3565	161.3138	175.1454	188.1452	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
34.2063	34.2063	34.2063	34.2063	34.2063	34.2063	34.2063	34.2063	34.2063	34.2063	34.2063	34.2063	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	(71)
Water heating gains (Table 5)												
74.2263	72.2008	67.9985	62.2870	58.5784	53.3579	48.9227	54.6076	56.6291	62.5402	69.2153	72.2124	(72)
Total internal gains												
348.2811	346.3296	334.0600	314.3017	294.3306	274.9894	262.3588	267.9698	278.0585	298.0164	320.9540	338.0718	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
East				6.9400	19.6403	0.6300	0.7000			0.7700			41.6561 (76)
West				7.6000	19.6403	0.6300	0.7000			0.7700			45.6176 (80)
Solar gains	87.2737	170.7259	281.1613	410.0570	502.5402	514.4393	489.7672	420.7028	327.0022	202.5807	108.8201	71.7697	(83)
Total gains	435.5548	517.0555	615.2213	724.3587	796.8708	789.4287	752.1261	688.6726	605.0607	500.5971	429.7741	409.8415	(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	41.6504	41.6504	41.6504	41.6504	41.6504	41.6504	41.6504	41.6504	41.6504	41.6504	41.6504	
alpha	3.7767	3.7767	3.7767	3.7767	3.7767	3.7767	3.7767	3.7767	3.7767	3.7767	3.7767	
util living area												
0.9925	0.9851	0.9645	0.9080	0.7955	0.6355	0.4874	0.5460	0.7864	0.9488	0.9868	0.9940	(86)
MIT	19.3232	19.5362	19.9038	20.3534	20.7148	20.9116	20.9751	20.9619	20.7975	20.2952	19.7104	19.2679 (87)
Th 2	19.8858	19.8858	19.8858	19.8858	19.8858	19.8858	19.8858	19.8858	19.8858	19.8858	19.8858	19.8858 (88)
util rest of house												
0.9906	0.9813	0.9552	0.8834	0.7429	0.5471	0.3729	0.4279	0.7113	0.9300	0.9828	0.9925	(89)
MIT 2	18.3671	18.5782	18.9396	19.3693	19.6909	19.8418	19.8783	19.8731	19.7678	19.3250	18.7528	18.3121 (90)
Living area fraction												
fLA = Living area / (4) =												0.1913 (91)
MIT	18.5500	18.7614	19.1240	19.5575	19.8867	20.0464	20.0881	20.0813	19.9647	19.5105	18.9360	18.4949 (92)
Temperature adjustment												0.0000
adjusted MIT	18.5500	18.7614	19.1240	19.5575	19.8867	20.0464	20.0881	20.0813	19.9647	19.5105	18.9360	18.4949 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9873	0.9761	0.9470	0.8748	0.7429	0.5607	0.3945	0.4497	0.7174	0.9219	0.9780	0.9897 (94)
Useful gains	430.0300	504.6727	582.6070	633.6951	592.0205	442.6241	296.7201	309.7214	434.0579	461.5039	420.3110	405.6290 (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												
	1236.2452	1202.5376	1095.1851	924.5838	710.2335	472.4987	302.6033	319.3713	508.7904	773.0246	1026.8206	1240.1399 (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												
	599.8240	468.9652	381.3581	209.4399	87.9505	0.0000	0.0000	0.0000	0.0000	231.7714	436.6869	620.8761 (98)
Space heating												3036.8722 (98)
Space heating per m2												(98) / (4) = 43.5082 (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													3348.2605 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	599.8240	468.9652	381.3581	209.4399	87.9505	0.0000	0.0000	0.0000	0.0000	231.7714	436.6869	620.8761	(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)	661.3275	517.0510	420.4610	230.9150	96.9686	0.0000	0.0000	0.0000	0.0000	255.5363	481.4630	684.5382	(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	173.8323	152.9124	159.8864	142.3541	138.7957	123.0081	117.1805	129.9073	130.0974	147.6680	157.3669	169.3239	(64)
Efficiency of water heater (217)m	89.8415	89.7613	89.5747	89.1655	88.3987	87.0000	87.0000	87.0000	87.0000	89.2233	89.6896	87.0000	(216)
Fuel for water heating, kWh/month	193.4878	170.3544	178.4952	159.6515	157.0109	141.3886	134.6902	149.3187	149.5373	165.5039	175.4573	188.3870	(219)
Water heating fuel used												1963.2827	(219)
Annual totals kWh/year													
Space heating fuel - main system												3348.2605	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEVCentralised, Database: in-use factor = 1.4000, SFP = 0.4200)													
mechanical ventilation fans (SFP = 0.4200)													90.4868 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													165.4868 (231)
Electricity for lighting (calculated in Appendix L)													310.9286 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.76 * 853 * 1.00) =													-518.6422 (233)
Total delivered energy for all uses													5269.3164 (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	3348.2605	0.2160	723.2243 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1963.2827	0.2160	424.0691 (264)
Space and water heating			1147.2933 (265)
Pumps and fans	165.4868	0.5190	85.8876 (267)
Energy for lighting	310.9286	0.5190	161.3720 (268)
Energy saving/generation technologies			
PV Unit	-518.6422	0.5190	-269.1753 (269)
Total CO2, kg/year			1125.3776 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			16.1200 (273)

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

DER			16.1200 ZC1
Total Floor Area		TFA	69.8000
Assumed number of occupants		N	2.2413
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			16.7102 ZC2
CO2 emissions from cooking, equation (L16)			2.4755 ZC3
Total CO2 emissions			35.3057 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			35.3057 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	34.9000 (1b)	x 2.3900 (2b)	= 83.4110 (1b) - (3b)
First floor	34.9000 (1c)	x 2.6700 (2c)	= 93.1830 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 176.5940 (5)

2. Ventilation rate

										main	secondary	other	total	m3 per hour			
										heating	heating						
Number of chimneys										0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues										0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans																2 * 10 =	20.0000 (7a)
Number of passive vents																0 * 10 =	0.0000 (7b)
Number of flueless gas fires																0 * 40 =	0.0000 (7c)
										Air changes per hour							
Infiltration due to chimneys, flues and fans										= (6a)+(6b)+(7a)+(7b)+(7c) =					20.0000	/ (5) =	0.1133 (8)
Pressure test										Yes							
Measured/design AP50										5.0000							
Infiltration rate										0.3633 (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) =					0.3360 (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	0.4284	0.4200	0.4116	0.3696	0.3612	0.3192	0.3192	0.3108	0.3360	0.3612	0.3780	0.3948 (22b)					
Effective ac	0.5918	0.5882	0.5847	0.5683	0.5652	0.5509	0.5509	0.5483	0.5565	0.5652	0.5714	0.5779 (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)			14.5400	1.3258	19.2765		(27)					
Ground Floor			34.9000	0.1300	4.5370		(28a)					
Brick and Block	124.3200	16.6600	107.6600	0.1800	19.3788		(29a)					
Pitched Roof	34.9000		34.9000	0.1300	4.5370		(30)					
Total net area of external elements Aum(A, m2)			194.1200				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		49.8493		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.4657 (36)					
Total fabric heat loss						(33) + (36) =	59.3150 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 34.4859	Feb 34.2783	Mar 34.0747	Apr 33.1186	May 32.9397	Jun 32.1070	Jul 32.1070	Aug 31.9528	Sep 32.4278	Oct 32.9397	Nov 33.3016	Dec 33.6799 (38)
Heat transfer coeff	93.8009	93.5933	93.3897	92.4336	92.2548	91.4220	91.4220	91.2678	91.7428	92.2548	92.6166	92.9950 (39)
Average = Sum(39)m / 12 =												92.4328 (39)
HLP	Jan 1.3439	Feb 1.3409	Mar 1.3380	Apr 1.3243	May 1.3217	Jun 1.3098	Jul 1.3098	Aug 1.3076	Sep 1.3144	Oct 1.3217	Nov 1.3269	Dec 1.3323 (40)
HLP (average)												1.3243 (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												2.2413 (42)
Average daily hot water use (litres/day)												87.4299 (43)
Daily hot water use	Jan 96.1729	Feb 92.6757	Mar 89.1785	Apr 85.6813	May 82.1841	Jun 78.6869	Jul 78.6869	Aug 82.1841	Sep 85.6813	Oct 89.1785	Nov 92.6757	Dec 96.1729 (44)
Energy conte	142.6216	124.7378	128.7182	112.2197	107.6774	92.9175	86.1017	98.8029	99.9830	116.5205	127.1912	138.1214 (45)
Energy content (annual)												Total = Sum(45)m = 1375.6130 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:	21.3932	18.7107	19.3077	16.8330	16.1516	13.9376	12.9153	14.8204	14.9974	17.4781	19.0787	20.7182 (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	49.0087	42.6562	45.4444	42.2538	41.8801	38.8045	40.0980	41.8801	42.2538	45.4444	45.7031	49.0087 (61)
Solar input	191.6303	167.3940	174.1626	154.4735	149.5576	131.7220	126.1997	140.6831	142.2368	161.9649	172.8943	187.1301 (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	191.6303	167.3940	174.1626	154.4735	149.5576	131.7220	126.1997	140.6831	142.2368	161.9649	172.8943	187.1301 (64)
	59.6739	52.1394	54.1599	47.8765	46.2728	40.5962	38.6533	43.3220	43.8078	50.1042	53.7169	58.1775 (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	112.0630	112.0630	112.0630	112.0630	112.0630	112.0630	112.0630	112.0630	112.0630	112.0630	112.0630	112.0630	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.6061	15.6376	12.7173	9.6278	7.1969	6.0759	6.5653	8.5338	11.4540	14.5435	16.9744	18.0954	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	196.8298	198.8723	193.7253	182.7680	168.9364	155.9366	147.2520	145.2095	150.3565	161.3138	175.1454	188.1452	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2063	34.2063	34.2063	34.2063	34.2063	34.2063	34.2063	34.2063	34.2063	34.2063	34.2063	34.2063	(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)	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	(71)
Water heating gains (Table 5)	80.2068	77.5883	72.7956	66.4951	62.1946	56.3836	51.9534	58.2285	60.8441	67.3443	74.6067	78.1956	(72)
Total internal gains	354.2616	351.7171	338.8571	318.5099	297.9468	278.0150	265.3895	271.5906	282.2735	302.8205	326.3454	344.0551	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W
East					6.9400	19.6403	0.6300	0.7000			0.7700	41.6561 (76)
West					7.6000	19.6403	0.6300	0.7000			0.7700	45.6176 (80)

Solar gains	87.2737	170.7259	281.1613	410.0570	502.5402	514.4393	489.7672	420.7028	327.0022	202.5807	108.8201	71.7697 (83)
Total gains	441.5353	522.4430	620.0184	728.5668	800.4870	792.4544	755.1567	692.2935	609.2757	505.4012	435.1655	415.8248 (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	51.6756	51.7903	51.9032	52.4400	52.5417	53.0203	53.0203	53.1099	52.8349	52.5417	52.3364	52.1235	
alpha	4.4450	4.4527	4.4602	4.4960	4.5028	4.5347	4.5347	4.5407	4.5223	4.5028	4.4891	4.4749	
util living area	0.9974	0.9941	0.9831	0.9439	0.8455	0.6783	0.5179	0.5802	0.8342	0.9728	0.9949	0.9980	(86)
MIT	19.5365	19.7160	20.0313	20.4383	20.7636	20.9378	20.9854	20.9762	20.8370	20.3897	19.8863	19.5059	(87)
Th 2	19.8066	19.8090	19.8112	19.8219	19.8239	19.8332	19.8332	19.8349	19.8296	19.8239	19.8198	19.8156	(88)
util rest of house	0.9965	0.9921	0.9770	0.9230	0.7903	0.5779	0.3880	0.4460	0.7538	0.9588	0.9928	0.9973	(89)
MIT 2	17.8755	18.1386	18.5967	19.1780	19.6007	19.7940	19.8283	19.8258	19.7026	19.1237	18.3955	17.8368	(90)
Living area fraction	18.1932	18.4403	18.8711	19.4190	19.8231	20.0127	20.0496	20.0458	19.9196	19.3659	18.6806	18.1561	(91)
MIT	18.1932	18.4403	18.8711	19.4190	19.8231	20.0127	20.0496	20.0458	19.9196	19.3659	18.6806	18.1561	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1932	18.4403	18.8711	19.4190	19.8231	20.0127	20.0496	20.0458	19.9196	19.3659	18.6806	18.1561	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	439.1523	516.4567	601.5058	665.8236	632.6221	471.1256	311.8372	326.4310	463.6938	480.7142	430.6256	414.0869	(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	1303.1935	1267.2800	1155.3316	972.3108	749.3930	494.8432	315.3678	332.7466	533.9027	808.6929	1072.5570	1297.8431	(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	642.8466	504.5533	412.0464	220.6708	86.8776	0.0000	0.0000	0.0000	0.0000	244.0161	462.1906	657.5147	(98)
Space heating												3230.7161	(98)
Space heating per m2												46.2853	(99)

8c. Space cooling requirement

Not applicable

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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													3459.0108 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	642.8466	504.5533	412.0464	220.6708	86.8776	0.0000	0.0000	0.0000	0.0000	244.0161	462.1906	657.5147	(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)	688.2726	540.2069	441.1632	236.2642	93.0167	0.0000	0.0000	0.0000	0.0000	261.2592	494.8508	703.9772	(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	191.6303	167.3940	174.1626	154.4735	149.5576	131.7220	126.1997	140.6831	142.2368	161.9649	172.8943	187.1301	(64)
Efficiency of water heater	87.8622	87.6535	87.1436	85.9486	83.7377	80.3000	80.3000	80.3000	80.3000	86.0806	87.4070	87.9492	(216)
Fuel for water heating, kWh/month	218.1032	190.9724	199.8571	179.7278	178.6024	164.0373	157.1602	175.1968	177.1317	188.1550	197.8037	212.7707	(219)
Water heating fuel used												2239.5184	(219)
Annual totals kWh/year													
Space heating fuel - main system												3459.0108	(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)												310.9286	(232)
Total delivered energy for all uses												6084.4578	(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	3459.0108	0.2160	747.1463 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2239.5184	0.2160	483.7360 (264)
Space and water heating			1230.8823 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	310.9286	0.5190	161.3720 (268)
Total CO2, kg/m2/year			1431.1793 (272)
Emissions per m2 for space and water heating			17.6344 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3119 (272b)
Emissions per m2 for pumps and fans			0.5577 (272c)
Target Carbon Dioxide Emission Rate (TER) = (17.6344 * 1.00) + 2.3119 + 0.5577, rounded to 2 d.p.			20.5000 (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	34.9000 (1b)	x 2.3900 (2b)	= 83.4110 (1b) - (3b)
First floor	34.9000 (1c)	x 2.6700 (2c)	= 93.1830 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 176.5940 (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					2 * 10 = 20.0000 (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)					20.0000 / (5) = 0.1133 (8)
Pressure test					Yes
Measured/design AP50					4.1700
Infiltration rate					0.3218 (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)	=	0.2976 (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	0.3795	0.3720	0.3646	0.3274	0.3199	0.2827	0.2827	0.2753	0.2976	0.3199	0.3348	0.3497 (22b)
Effective ac	0.5720	0.5692	0.5665	0.5536	0.5512	0.5400	0.5400	0.5379	0.5443	0.5512	0.5561	0.5611 (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)			14.5400	1.1450	16.6489		(27)
Ground Floor			34.9000	0.1200	4.1880	84.0000	2931.6000 (28a)
Brick and Block	124.3200	16.6600	107.6600	0.2400	25.8384	42.2200	4545.4052 (29a)
Pitched Roof	34.9000		34.9000	0.1000	3.4900	9.1000	317.5900 (30)
Total net area of external elements Aum(A, m ²)			194.1200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	52.4973		(33)
GF Stud			18.5500			9.0000	166.9500 (32c)
First Floor			66.1200			9.0000	595.0800 (32c)
GF Block			42.6000			75.0000	3195.0000 (32c)
Internal Floor 1			34.9000			18.0000	628.2000 (32d)
Internal Ceiling 1			34.9000			9.0000	314.1000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 12693.9252 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 181.8614 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.1189 (36)
Total fabric heat loss (33) + (36) = 57.6161 (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	33.3338	33.1709	33.0112	32.2610	32.1207	31.4674	31.4674	31.3464	31.7190	32.1207	32.4046	32.7014 (38)
Heat transfer coeff	90.9499	90.7870	90.6273	89.8772	89.7368	89.0835	89.0835	88.9625	89.3351	89.7368	90.0207	90.3175 (39)
Average = Sum(39)m / 12 =												89.8765 (39)
HLP	1.3030	1.3007	1.2984	1.2876	1.2856	1.2763	1.2763	1.2745	1.2799	1.2856	1.2897	1.2939 (40)
HLP (average)												1.2876 (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												2.2413 (42)
Average daily hot water use (litres/day)												87.4299 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	96.1729	92.6757	89.1785	85.6813	82.1841	78.6869	78.6869	82.1841	85.6813	89.1785	92.6757	96.1729 (44)
Energy conte	142.6216	124.7378	128.7182	112.2197	107.6774	92.9175	86.1017	98.8029	99.9830	116.5205	127.1912	138.1214 (45)
Energy content (annual)										Total = Sum(45)m =		1375.6130 (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	30.3071	26.5068	27.3526	23.8467	22.8815	19.7450	18.2966	20.9956	21.2464	24.7606	27.0281	29.3508 (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	112.0630	112.0630	112.0630	112.0630	112.0630	112.0630	112.0630	112.0630	112.0630	112.0630	112.0630	112.0630	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.6061	15.6376	12.7173	9.6278	7.1969	6.0759	6.5653	8.5338	11.4540	14.5435	16.9744	18.0954	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	196.8298	198.8723	193.7253	182.7680	168.9364	155.9366	147.2520	145.2095	150.3565	161.3138	175.1454	188.1452	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2063	34.2063	34.2063	34.2063	34.2063	34.2063	34.2063	34.2063	34.2063	34.2063	34.2063	34.2063	(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)	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	(71)
Water heating gains (Table 5)	40.7353	39.4446	36.7643	33.1204	30.7546	27.4236	24.5922	28.2199	29.5089	33.2804	37.5391	39.4500	(72)
Total internal gains	311.7901	310.5734	299.8258	282.1351	263.5068	246.0550	235.0283	238.5821	247.9382	265.7565	286.2778	302.3095	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
East					6.9400	19.6403	0.6300	0.7000	0.7700		41.6561 (76)	
West					7.6000	19.6403	0.6300	0.7000	0.7700		45.6176 (80)	
Solar gains	87.2737	170.7259	281.1613	410.0570	502.5402	514.4393	489.7672	420.7028	327.0022	202.5807	108.8201	71.7697 (83)
Total gains	399.0639	481.2993	580.9871	692.1921	766.0471	760.4943	724.7956	659.2849	574.9404	468.3372	395.0979	374.0791 (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	38.7696	38.8392	38.9076	39.2323	39.2937	39.5819	39.5819	39.6357	39.4704	39.2937	39.1698	39.0410	
alpha	3.5846	3.5893	3.5938	3.6155	3.6196	3.6388	3.6388	3.6424	3.6314	3.6196	3.6113	3.6027	
util living area	0.9939	0.9875	0.9696	0.9189	0.8158	0.6605	0.5126	0.5742	0.8105	0.9572	0.9893	0.9951	(86)
MIT	19.1413	19.3655	19.7553	20.2498	20.6514	20.8869	20.9660	20.9489	20.7496	20.1936	19.5707	19.0997	(87)
Th 2	19.8385	19.8403	19.8421	19.8505	19.8521	19.8595	19.8595	19.8608	19.8566	19.8521	19.8489	19.8456	(88)
util rest of house	0.9923	0.9842	0.9614	0.8965	0.7651	0.5707	0.3919	0.4510	0.7384	0.9409	0.9860	0.9939	(89)
MIT 2	18.1537	18.3776	18.7634	19.2462	19.6103	19.8020	19.8489	19.8432	19.7072	19.2044	18.5896	18.1175	(90)
Living area fraction									fLA = Living area / (4) =			0.1913	(91)
MIT	18.3426	18.5666	18.9531	19.4381	19.8094	20.0095	20.0626	20.0547	19.9066	19.3936	18.7772	18.3053	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3426	18.5666	18.9531	19.4381	19.8094	20.0095	20.0626	20.0547	19.9066	19.3936	18.7772	18.3053	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9893	0.9793	0.9532	0.8867	0.7630	0.5835	0.4145	0.4734	0.7421	0.9324	0.9816	0.9914	(94)
Ext temp.	394.8034	471.3283	553.7725	613.7890	584.4826	443.7372	300.3918	312.0910	426.6450	436.6876	387.8192	370.8715	(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	1277.1737	1240.7467	1128.5939	947.1357	727.7154	481.8945	308.4586	325.1315	518.7335	789.1065	1051.1917	1273.9599	(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	656.4835	517.0492	427.6671	240.0096	106.5652	0.0000	0.0000	0.0000	0.0000	262.1997	477.6282	671.8978	(98)
Space heating per m2												3359.5003	(98)
										(98) / (4) =		48.1304	(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	837.3848	659.2178	676.1150	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8388	0.8953	0.8654	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	702.3753	590.1836	585.1260	0.0000	0.0000	0.0000	0.0000	(102)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	972.1613	928.7536	853.5295	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	194.2459	251.8961	199.6922	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												645.8342 (104)
Cooled fraction									fC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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	48.5615	62.9740	49.9230	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												161.4585 (107)
Space cooling per m2												2.3132 (108)
Energy for space heating												48.1304 (99)
Energy for space cooling												2.3132 (108)
Total												50.4435 (109)
Dwelling Fabric Energy Efficiency (DFEE)												50.4 (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	34.9000 (1b)	x 2.3900 (2b)	= 83.4110 (1b) - (3b)
First floor	34.9000 (1c)	x 2.6700 (2c)	= 93.1830 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 176.5940 (5)

2. Ventilation rate

										main	secondary	other	total	m3 per hour			
										heating	heating						
Number of chimneys										0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues										0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans																2 * 10 =	20.0000 (7a)
Number of passive vents																0 * 10 =	0.0000 (7b)
Number of flueless gas fires																0 * 40 =	0.0000 (7c)
										Air changes per hour							
Infiltration due to chimneys, flues and fans										= (6a)+(6b)+(7a)+(7b)+(7c) =					20.0000	/ (5) =	0.1133 (8)
Pressure test										Yes							
Measured/design AP50										5.0000							
Infiltration rate										0.3633 (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) =					0.3360 (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	0.4284	0.4200	0.4116	0.3696	0.3612	0.3192	0.3192	0.3108	0.3360	0.3612	0.3780	0.3948	(22b)				
Effective ac	0.5918	0.5882	0.5847	0.5683	0.5652	0.5509	0.5509	0.5483	0.5565	0.5652	0.5714	0.5779	(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)			14.5400	1.3258	19.2765		(27)					
Ground Floor			34.9000	0.1300	4.5370		(28a)					
Brick and Block	124.3200	16.6600	107.6600	0.1800	19.3788		(29a)					
Pitched Roof	34.9000		34.9000	0.1300	4.5370		(30)					
Total net area of external elements Aum(A, m2)			194.1200				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		49.8493		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.4657 (36)					
Total fabric heat loss						(33) + (36) =	59.3150 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 34.4859	Feb 34.2783	Mar 34.0747	Apr 33.1186	May 32.9397	Jun 32.1070	Jul 32.1070	Aug 31.9528	Sep 32.4278	Oct 32.9397	Nov 33.3016	Dec 33.6799 (38)
Heat transfer coeff	93.8009	93.5933	93.3897	92.4336	92.2548	91.4220	91.4220	91.2678	91.7428	92.2548	92.6166	92.9950 (39)
Average = Sum(39)m / 12 =												92.4328 (39)
HLP	Jan 1.3439	Feb 1.3409	Mar 1.3380	Apr 1.3243	May 1.3217	Jun 1.3098	Jul 1.3098	Aug 1.3076	Sep 1.3144	Oct 1.3217	Nov 1.3269	Dec 1.3323 (40)
HLP (average)												1.3243 (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												2.2413 (42)
Average daily hot water use (litres/day)												87.4299 (43)
Daily hot water use	Jan 96.1729	Feb 92.6757	Mar 89.1785	Apr 85.6813	May 82.1841	Jun 78.6869	Jul 78.6869	Aug 82.1841	Sep 85.6813	Oct 89.1785	Nov 92.6757	Dec 96.1729 (44)
Energy conte	142.6216	124.7378	128.7182	112.2197	107.6774	92.9175	86.1017	98.8029	99.9830	116.5205	127.1912	138.1214 (45)
Energy content (annual)												Total = Sum(45)m = 1375.6130 (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)
	30.3071	26.5068	27.3526	23.8467	22.8815	19.7450	18.2966	20.9956	21.2464	24.7606	27.0281	29.3508 (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	112.0630	112.0630	112.0630	112.0630	112.0630	112.0630	112.0630	112.0630	112.0630	112.0630	112.0630	112.0630	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.6061	15.6376	12.7173	9.6278	7.1969	6.0759	6.5653	8.5338	11.4540	14.5435	16.9744	18.0954	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	196.8298	198.8723	193.7253	182.7680	168.9364	155.9366	147.2520	145.2095	150.3565	161.3138	175.1454	188.1452	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2063	34.2063	34.2063	34.2063	34.2063	34.2063	34.2063	34.2063	34.2063	34.2063	34.2063	34.2063	(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)	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	(71)
Water heating gains (Table 5)	40.7353	39.4446	36.7643	33.1204	30.7546	27.4236	24.5922	28.2199	29.5089	33.2804	37.5391	39.4500	(72)
Total internal gains	311.7901	310.5734	299.8258	282.1351	263.5068	246.0550	235.0283	238.5821	247.9382	265.7565	286.2778	302.3095	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W	
East				6.9400	19.6403	0.6300		0.7000		0.7700		41.6561 (76)	
West				7.6000	19.6403	0.6300		0.7000		0.7700		45.6176 (80)	

Solar gains	87.2737	170.7259	281.1613	410.0570	502.5402	514.4393	489.7672	420.7028	327.0022	202.5807	108.8201	71.7697	(83)
Total gains	399.0639	481.2993	580.9871	692.1921	766.0471	760.4943	724.7956	659.2849	574.9404	468.3372	395.0979	374.0791	(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	51.6756	51.7903	51.9032	52.4400	52.5417	53.0203	53.0203	53.1099	52.8349	52.5417	52.3364	52.1235	
alpha	4.4450	4.4527	4.4602	4.4960	4.5028	4.5347	4.5347	4.5407	4.5223	4.5028	4.4891	4.4749	
util living area	0.9983	0.9958	0.9868	0.9525	0.8614	0.6988	0.5372	0.6043	0.8560	0.9793	0.9965	0.9987	(86)
MIT	19.4819	19.6638	19.9841	20.4013	20.7415	20.9298	20.9831	20.9720	20.8159	20.3466	19.8351	19.4520	(87)
Th 2	19.8066	19.8090	19.8112	19.8219	19.8239	19.8332	19.8332	19.8349	19.8296	19.8239	19.8198	19.8156	(88)
util rest of house	0.9977	0.9943	0.9818	0.9341	0.8092	0.5982	0.4037	0.4668	0.7804	0.9683	0.9951	0.9983	(89)
MIT 2	18.4337	18.6168	18.9360	19.3485	19.6548	19.8025	19.8292	19.8274	19.7291	19.3053	18.7967	18.4108	(90)
Living area fraction													0.1913 (91)
MIT	18.6342	18.8170	19.1365	19.5499	19.8627	20.0181	20.0499	20.0463	19.9369	19.5045	18.9953	18.6100	(92)
Temperature adjustment													0.0000
adjusted MIT	18.6342	18.8170	19.1365	19.5499	19.8627	20.0181	20.0499	20.0463	19.9369	19.5045	18.9953	18.6100	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9968	0.9925	0.9780	0.9288	0.8112	0.6155	0.4295	0.4933	0.7887	0.9641	0.9936	0.9976	(94)
Ext temp.	397.7939	477.6788	568.2153	642.8974	621.4176	468.0769	311.2648	325.2292	453.4333	451.5397	392.5503	373.1850	(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	1344.5626	1302.5417	1180.1194	984.4067	753.0443	495.3320	315.4003	332.7943	535.4966	821.4782	1101.7025	1340.0530	(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	704.3959	554.3079	455.2566	245.8867	97.9303	0.0000	0.0000	0.0000	0.0000	275.2343	510.5895	719.3498	(98)
Space heating per m2												3562.9510	(98)
												51.0451	(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	859.3671	676.5231	693.6355	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8659	0.9219	0.8931	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	744.1480	623.7175	619.4745	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	972.1613	928.7536	853.5295	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	164.1696	226.9468	174.1369	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												565.2534 (104)
Cooled fraction												1.0000 (105)
									fC = cooled area / (4) =			

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Intermittency factor (Table 10b)	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	41.0424	56.7367	43.5342	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling											141.3133 (107)
Space cooling per m2											2.0245 (108)
Energy for space heating											51.0451 (99)
Energy for space cooling											2.0245 (108)
Total											53.0697 (109)
Target Fabric Energy Efficiency (TFEE)											61.0 (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	34.9000 (1b)	x 2.3900 (2b)	= 83.4110 (1b) - (3b)
First floor	34.9000 (1c)	x 2.6700 (2c)	= 93.1830 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	176.5940 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					4.1700
Infiltration rate					0.2085 (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) =		0.1929 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000 (22)
Wind factor	1.1750	1.1000	1.1000	1.0000	1.0250	0.9750	0.9750	0.9500	0.9500	1.0250	1.0000	1.0250 (22a)
Adj infilt rate	0.2266	0.2121	0.2121	0.1929	0.1977	0.1880	0.1880	0.1832	0.1832	0.1977	0.1929	0.1977 (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)			14.5400	1.1450	16.6489		(27)
Ground Floor			34.9000	0.1200	4.1880	84.0000	2931.6000 (28a)
Brick and Block	124.3200	16.6600	107.6600	0.2400	25.8384	42.2200	4545.4052 (29a)
Pitched Roof	34.9000		34.9000	0.1000	3.4900	9.1000	317.5900 (30)
Total net area of external elements Aum(A, m ²)			194.1200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	52.4973		(33)
GF Stud			18.5500			9.0000	166.9500 (32c)
First Floor			66.1200			9.0000	595.0800 (32c)
GF Block			42.6000			75.0000	3195.0000 (32c)
Internal Floor 1			34.9000			18.0000	628.2000 (32d)
Internal Ceiling 1			34.9000			18.0000	628.2000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13008.0252 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							186.3614 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.1189 (36)
Total fabric heat loss						(33) + (36) =	57.6161 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380 (38)
Average = Sum(39)m / 12 =	86.7541	86.7541	86.7541	86.7541	86.7541	86.7541	86.7541	86.7541	86.7541	86.7541	86.7541	86.7541 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2429	1.2429	1.2429	1.2429	1.2429	1.2429	1.2429	1.2429	1.2429	1.2429	1.2429	1.2429 (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												2.2413 (42)
Average daily hot water use (litres/day)												87.4299 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Energy conte	96.1729	92.6757	89.1785	85.6813	82.1841	78.6869	78.6869	82.1841	85.6813	89.1785	92.6757	96.1729 (44)
142.6216	124.7378	128.7182	112.2197	107.6774	92.9175	86.1017	98.8029	99.9830	116.5205	127.1912	138.1214 (45)	
Energy content (annual)	Total = Sum(45)m =											1375.6130 (45)
Distribution loss (46)m = 0.15 x (45)m	21.3932	18.7107	19.3077	16.8330	16.1516	13.9376	12.9153	14.8204	14.9974	17.4781	19.0787	20.7182 (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	31.2107	28.1746	31.1682	30.1344	31.1182	30.0906	31.0788	31.1044	30.1145	31.1475	30.1757	31.2025 (61)
Total heat required for water heating calculated for each month	173.8323	152.9124	159.8864	142.3541	138.7957	123.0081	117.1805	129.9073	130.0974	147.6680	157.3669	169.3239 (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	173.8323	152.9124	159.8864	142.3541	138.7957	123.0081	117.1805	129.9073	130.0974	147.6680	157.3669	169.3239 (64)
RHI water heating demand	Total per year (kWh/year) = Sum(64)m =											1742.3330 (64)
Heat gains from water heating, kWh/month	55.2244	48.5190	50.5909	44.8466	43.5823	38.4177	36.3985	40.6281	40.7729	46.5299	49.8350	53.7260 (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	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	44.0152	39.0939	31.7933	24.0696	17.9923	15.1898	16.4132	21.3344	28.6350	36.3588	42.4360	45.2385 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	293.7759	296.8243	289.1423	272.7881	252.1439	232.7412	219.7790	216.7306	224.4126	240.7668	261.4110	280.8137 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888 (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)	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504 (71)
Water heating gains (Table 5)	74.2263	72.2008	67.9985	62.2870	58.5784	53.3579	48.9227	54.6076	56.6291	62.5402	69.2153	72.2124 (72)
Total internal gains	510.5313	506.6331	487.4480	457.6587	427.2285	399.8030	383.6289	391.1866	408.1908	438.1798	471.5764	496.7785 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
East				6.9400	25.1733	0.6300	0.7000			0.7700			53.3913 (76)
West				7.6000	25.1733	0.6300	0.7000			0.7700			58.4689 (80)

Solar gains	111.8602	186.1437	311.0982	453.1011	520.4461	588.5912	538.7456	484.3497	377.9988	238.1263	139.0199	87.0706 (83)	
Total gains	622.3915	692.7767	798.5463	910.7597	947.6746	988.3941	922.3745	875.5364	786.1896	676.3061	610.5963	583.8491 (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	41.6504	41.6504	41.6504	41.6504	41.6504	41.6504	41.6504	41.6504	41.6504	41.6504	41.6504	41.6504
alpha	3.7767	3.7767	3.7767	3.7767	3.7767	3.7767	3.7767	3.7767	3.7767	3.7767	3.7767	3.7767
util living area	0.9694	0.9545	0.9091	0.8052	0.6484	0.4355	0.3078	0.3142	0.5753	0.8396	0.9454	0.9743 (86)
MIT	19.7914	19.9442	20.2799	20.6499	20.8831	20.9802	20.9961	20.9959	20.9447	20.6630	20.1777	19.7488 (87)
Th 2	19.8858	19.8858	19.8858	19.8858	19.8858	19.8858	19.8858	19.8858	19.8858	19.8858	19.8858	19.8858 (88)
util rest of house	0.9616	0.9434	0.8874	0.7620	0.5778	0.3455	0.2052	0.2063	0.4768	0.7902	0.9293	0.9676 (89)
MIT 2	18.8288	18.9768	19.2965	19.6302	19.8179	19.8788	19.8852	19.8852	19.8622	19.6531	19.2068	18.7877 (90)
Living area fraction	19.0129	19.1618	19.4846	19.8253	20.0217	20.0894	20.0977	20.0977	fLA = Living area / (4) =	20.0693	19.8463	19.3925
MIT	19.0129	19.1618	19.4846	19.8253	20.0217	20.0894	20.0977	20.0977	20.0693	19.8463	19.3925	18.9715 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0129	19.1618	19.4846	19.8253	20.0217	20.0894	20.0977	20.0977	20.0693	19.8463	19.3925	18.9715 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9539	0.9344	0.8781	0.7594	0.5869	0.3624	0.2249	0.2270	0.4939	0.7881	0.9205	0.9605 (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	1163.6219	1141.8414	1031.0388	843.7065	600.4823	363.4501	208.0075	199.3307	405.0796	672.0217	936.2949	1151.3593 (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	424.0221	332.3173	245.3740	109.4899	32.9400	0.0000	0.0000	0.0000	0.0000	103.4192	269.4717	439.3726 (98)
Space heating												1956.4068 (98)
RHI space heating demand												1956 (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	34.9000 (1b)	x 2.3900 (2b)	= 83.4110 (1b) - (3b)
First floor	34.9000 (1c)	x 2.6700 (2c)	= 93.1830 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 176.5940 (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												4.1700
Infiltration rate												0.2085 (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) =	0.1929 (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												
	0.2459	0.2411	0.2363	0.2121	0.2073	0.1832	0.1832	0.1784	0.1929	0.2073	0.2170	0.2266 (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)			14.5400	1.1450	16.6489		(27)
Ground Floor			34.9000	0.1200	4.1880	84.0000	2931.6000 (28a)
Brick and Block	124.3200	16.6600	107.6600	0.2400	25.8384	42.2200	4545.4052 (29a)
Pitched Roof	34.9000		34.9000	0.1000	3.4900	9.1000	317.5900 (30)
Total net area of external elements Aum(A, m ²)			194.1200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	52.4973		(33)
GF Stud			18.5500			9.0000	166.9500 (32c)
First Floor			66.1200			9.0000	595.0800 (32c)
GF Block			42.6000			75.0000	3195.0000 (32c)
Internal Floor 1			34.9000			18.0000	628.2000 (32d)
Internal Ceiling 1			34.9000			18.0000	628.2000 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 13008.0252 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							186.3614 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.1189 (36)
Total fabric heat loss						(33) + (36) =	57.6161 (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	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380 (38)
Heat transfer coeff	86.7541	86.7541	86.7541	86.7541	86.7541	86.7541	86.7541	86.7541	86.7541	86.7541	86.7541	86.7541 (39)
Average = Sum(39)m / 12 =												86.7541 (39)
HLP	1.2429	1.2429	1.2429	1.2429	1.2429	1.2429	1.2429	1.2429	1.2429	1.2429	1.2429	1.2429 (40)
HLP (average)												1.2429 (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	2.2413 (42)
Average daily hot water use (litres/day)	87.4299 (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	96.1729	92.6757	89.1785	85.6813	82.1841	78.6869	78.6869	82.1841	85.6813	89.1785	92.6757	96.1729 (44)
142.6216	124.7378	128.7182	112.2197	107.6774	92.9175	86.1017	86.1017	98.8029	99.9830	116.5205	127.1912	138.1214 (45)
Energy content (annual)										Total = Sum (45)m =		1375.6130 (45)
Distribution loss (46)m = 0.15 x (45)m												
21.3932	18.7107	19.3077	16.8330	16.1516	13.9376	12.9153	14.8204	14.9974	17.4781	19.0787	20.7182	(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	31.2107	28.1746	31.1682	30.1344	31.1182	30.0906	31.0788	31.1044	30.1145	31.1475	30.1757	31.2025 (61)
Total heat required for water heating calculated for each month												
173.8323	152.9124	159.8864	142.3541	138.7957	123.0081	117.1805	129.9073	130.0974	147.6680	157.3669	169.3239	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum (63)m =												0.0000 (63)
Output from w/h												
173.8323	152.9124	159.8864	142.3541	138.7957	123.0081	117.1805	129.9073	130.0974	147.6680	157.3669	169.3239	(64)
Heat gains from water heating, kWh/month												
55.2244	48.5190	50.5909	44.8466	43.5823	38.4177	36.3985	40.6281	40.7729	46.5299	49.8350	53.7260	(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
134.4756	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
44.0152	39.0939	31.7933	24.0696	17.9923	15.1898	16.4132	21.3344	28.6350	36.3588	42.4360	45.2385	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
293.7759	296.8243	289.1423	272.7881	252.1439	232.7412	219.7790	216.7306	224.4126	240.7668	261.4110	280.8137	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
50.6888	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	(71)
Water heating gains (Table 5)												
74.2263	72.2008	67.9985	62.2870	58.5784	53.3579	48.9227	54.6076	56.6291	62.5402	69.2153	72.2124	(72)
Total internal gains												
510.5313	506.6331	487.4480	457.6587	427.2285	399.8030	383.6289	391.1866	408.1908	438.1798	471.5764	496.7785	(73)

6. Solar gains

[Jan]												Gains	
				Area	Solar flux			g	FF		Access		W
				m2	Table 6a			Specific data	Specific data		factor		
					W/m2			or Table 6b	or Table 6c		Table 6d		
East				6.9400	19.6403			0.6300	0.7000		0.7700		41.6561 (76)
West				7.6000	19.6403			0.6300	0.7000		0.7700		45.6176 (80)

Solar gains	87.2737	170.7259	281.1613	410.0570	502.5402	514.4393	489.7672	420.7028	327.0022	202.5807	108.8201	71.7697	(83)
Total gains	597.8051	677.3590	768.6093	867.7156	929.7687	914.2423	873.3962	811.8894	735.1930	640.7605	580.3964	568.5482	(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	41.6504	41.6504	41.6504	41.6504	41.6504	41.6504	41.6504	41.6504	41.6504	41.6504	41.6504	
alpha	3.7767	3.7767	3.7767	3.7767	3.7767	3.7767	3.7767	3.7767	3.7767	3.7767	3.7767	
util living area	0.9789	0.9654	0.9331	0.8586	0.7313	0.5674	0.4260	0.4738	0.7029	0.9011	0.9662	0.9824 (86)
MIT	19.5755	19.7747	20.1080	20.4974	20.7907	20.9397	20.9841	20.9763	20.8650	20.4642	19.9359	19.5172 (87)
Th 2	19.8858	19.8858	19.8858	19.8858	19.8858	19.8858	19.8858	19.8858	19.8858	19.8858	19.8858	19.8858 (88)
util rest of house	0.9739	0.9573	0.9173	0.8260	0.6737	0.4824	0.3232	0.3668	0.6216	0.8704	0.9567	0.9781 (89)
MIT 2	18.6158	18.8109	19.1333	19.4960	19.7477	19.8569	19.8812	19.8783	19.8117	19.4770	18.9721	18.5584 (90)
Living area fraction									fLA = Living area / (4) =			0.1913 (91)
MIT	18.7994	18.9952	19.3197	19.6876	19.9472	20.0640	20.0921	20.0883	20.0132	19.6658	19.1564	18.7418 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7994	18.9952	19.3197	19.6876	19.9472	20.0640	20.0921	20.0883	20.0132	19.6658	19.1564	18.7418 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9675	0.9490	0.9077	0.8194	0.6772	0.4967	0.3427	0.3869	0.6318	0.8631	0.9488	0.9723 (94)
Useful gains	578.3534	642.8463	697.6410	711.0439	629.5995	454.0587	299.3063	314.1464	464.4650	553.0475	550.6772	552.8052 (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												
	1257.8784	1222.8198	1112.1651	935.8650	715.4763	474.0270	302.9582	319.9727	512.9914	786.4930	1045.9453	1261.5613 (97)
Month fracti	1.0000	1.0000		1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh												
	505.5666	389.7422	308.4060	161.8712	63.8923	0.0000	0.0000	0.0000	0.0000	173.6835	356.5930	527.3145 (98)
Space heating												2487.0694 (98)
Space heating per m2												(98) / (4) = 35.6314 (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													2742.0831 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	505.5666	389.7422	308.4060	161.8712	63.8923	0.0000	0.0000	0.0000	0.0000	173.6835	356.5930	527.3145	(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)	557.4053	429.7047	340.0286	178.4688	70.4436	0.0000	0.0000	0.0000	0.0000	191.4923	393.1566	581.3832	(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	173.8323	152.9124	159.8864	142.3541	138.7957	123.0081	117.1805	129.9073	130.0974	147.6680	157.3669	169.3239	(64)
Efficiency of water heater	89.7237	89.6259	89.4019	88.9303	88.1333	87.0000	87.0000	87.0000	87.0000	88.9614	89.5341	87.0000	(216)
(217)m	89.7237	89.6259	89.4019	88.9303	88.1333	87.0000	87.0000	87.0000	87.0000	88.9614	89.5341	89.7720	(217)
Fuel for water heating, kWh/month	193.7419	170.6118	178.8402	160.0738	157.4838	141.3886	134.6902	149.3187	149.5373	165.9910	175.7619	188.6155	(219)
Water heating fuel used												1966.0546	(219)
Annual totals kWh/year													
Space heating fuel - main system												2742.0831	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEVCentralised, Database: in-use factor = 1.4000, SFP = 0.4200)													
mechanical ventilation fans (SFP = 0.4200)												90.4868	(230a)
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												165.4868	(231)
Electricity for lighting (calculated in Appendix L)												310.9286	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.76 * 853 * 1.00) =										-518.6422		-518.6422	(233)
Total delivered energy for all uses												4665.9109	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2742.0831	3.4800	95.4245 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1966.0546	3.4800	68.4187 (247)
Mechanical ventilation fans	90.4868	13.1900	11.9352 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	310.9286	13.1900	41.0115 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-518.6422	13.1900	-68.4089 (252)
Total energy cost			278.2735 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.4200 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] = 1.0181 (257)
SAP value	85.7979
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	2742.0831	0.2160	592.2900 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1966.0546	0.2160	424.6678 (264)
Space and water heating			1016.9577 (265)
Pumps and fans	165.4868	0.5190	85.8876 (267)
Energy for lighting	310.9286	0.5190	161.3720 (268)
Energy saving/generation technologies			
PV Unit	-518.6422	0.5190	-269.1753 (269)
Total kg/year			995.0420 (272)
CO2 emissions per m2			14.2600 (273)
EI value			88.3854
EI rating			88 (274)
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	$3.48 / 0.8851 = 3.932$, stars = 4
Water heating environmental impact	$0.216 / 0.8851 = 0.2440$, 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	34.9000 (1b)	x 2.3900 (2b)	= 83.4110 (1b) - (3b)
First floor	34.9000 (1c)	x 2.6700 (2c)	= 93.1830 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 176.5940 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					4.1700
Infiltration rate					0.2085 (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) =		0.1929 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000 (22)
Wind factor	1.1750	1.1000	1.1000	1.0000	1.0250	0.9750	0.9750	0.9500	0.9500	1.0250	1.0000	1.0250 (22a)
Adj infilt rate	0.2266	0.2121	0.2121	0.1929	0.1977	0.1880	0.1880	0.1832	0.1832	0.1977	0.1929	0.1977 (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)			14.5400	1.1450	16.6489		(27)
Ground Floor			34.9000	0.1200	4.1880	84.0000	2931.6000 (28a)
Brick and Block	124.3200	16.6600	107.6600	0.2400	25.8384	42.2200	4545.4052 (29a)
Pitched Roof	34.9000		34.9000	0.1000	3.4900	9.1000	317.5900 (30)
Total net area of external elements Aum(A, m ²)			194.1200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	52.4973		(33)
GF Stud			18.5500			9.0000	166.9500 (32c)
First Floor			66.1200			9.0000	595.0800 (32c)
GF Block			42.6000			75.0000	3195.0000 (32c)
Internal Floor 1			34.9000			18.0000	628.2000 (32d)
Internal Ceiling 1			34.9000			18.0000	628.2000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13008.0252 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							186.3614 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.1189 (36)
Total fabric heat loss						(33) + (36) =	57.6161 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380 (38)
Average = Sum(39)m / 12 =	86.7541	86.7541	86.7541	86.7541	86.7541	86.7541	86.7541	86.7541	86.7541	86.7541	86.7541	86.7541 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2429	1.2429	1.2429	1.2429	1.2429	1.2429	1.2429	1.2429	1.2429	1.2429	1.2429	1.2429 (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												2.2413 (42)
Average daily hot water use (litres/day)												87.4299 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Energy conte	96.1729	92.6757	89.1785	85.6813	82.1841	78.6869	78.6869	82.1841	85.6813	89.1785	92.6757	96.1729 (44)
142.6216	124.7378	128.7182	112.2197	107.6774	92.9175	86.1017	98.8029	99.9830	116.5205	127.1912	138.1214 (45)	
Energy content (annual)												Total = Sum(45)m = 1375.6130 (45)
Distribution loss (46)m = 0.15 x (45)m												
21.3932	18.7107	19.3077	16.8330	16.1516	13.9376	12.9153	14.8204	14.9974	17.4781	19.0787	20.7182 (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	31.2107	28.1746	31.1682	30.1344	31.1182	30.0906	31.0788	31.1044	30.1145	31.1475	30.1757	31.2025 (61)
Total heat required for water heating calculated for each month												
173.8323	152.9124	159.8864	142.3541	138.7957	123.0081	117.1805	129.9073	130.0974	147.6680	157.3669	169.3239 (62)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)	
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h												
173.8323	152.9124	159.8864	142.3541	138.7957	123.0081	117.1805	129.9073	130.0974	147.6680	157.3669	169.3239 (64)	
Heat gains from water heating, kWh/month												
55.2244	48.5190	50.5909	44.8466	43.5823	38.4177	36.3985	40.6281	40.7729	46.5299	49.8350	53.7260 (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	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	44.0152	39.0939	31.7933	24.0696	17.9923	15.1898	16.4132	21.3344	28.6350	36.3588	42.4360	45.2385 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	293.7759	296.8243	289.1423	272.7881	252.1439	232.7412	219.7790	216.7306	224.4126	240.7668	261.4110	280.8137 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888 (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)												
	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504 (71)
Water heating gains (Table 5)												
	74.2263	72.2008	67.9985	62.2870	58.5784	53.3579	48.9227	54.6076	56.6291	62.5402	69.2153	72.2124 (72)
Total internal gains												
	510.5313	506.6331	487.4480	457.6587	427.2285	399.8030	383.6289	391.1866	408.1908	438.1798	471.5764	496.7785 (73)

6. Solar gains

[Jan]				Area	Solar flux	g		FF		Access		Gains
				m2	Table 6a	Specific data		Specific data		factor		W
					W/m2	or Table 6b		or Table 6c		Table 6d		
East				6.9400	25.1733	0.6300		0.7000		0.7700		53.3913 (76)
West				7.6000	25.1733	0.6300		0.7000		0.7700		58.4689 (80)
Solar gains	111.8602	186.1437	311.0982	453.1011	520.4461	588.5912	538.7456	484.3497	377.9988	238.1263	139.0199	87.0706 (83)
Total gains	622.3915	692.7767	798.5463	910.7597	947.6746	988.3941	922.3745	875.5364	786.1896	676.3061	610.5963	583.8491 (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	41.6504	41.6504	41.6504	41.6504	41.6504	41.6504	41.6504	41.6504	41.6504	41.6504	41.6504	41.6504
alpha	3.7767	3.7767	3.7767	3.7767	3.7767	3.7767	3.7767	3.7767	3.7767	3.7767	3.7767	3.7767
util living area												
	0.9694	0.9545	0.9091	0.8052	0.6484	0.4355	0.3078	0.3142	0.5753	0.8396	0.9454	0.9743 (86)
MIT	19.7914	19.9442	20.2799	20.6499	20.8831	20.9802	20.9961	20.9959	20.9447	20.6630	20.1777	19.7488 (87)
Th 2	19.8858	19.8858	19.8858	19.8858	19.8858	19.8858	19.8858	19.8858	19.8858	19.8858	19.8858	19.8858 (88)
util rest of house												
	0.9616	0.9434	0.8874	0.7620	0.5778	0.3455	0.2052	0.2063	0.4768	0.7902	0.9293	0.9676 (89)
MIT 2	18.8288	18.9768	19.2965	19.6302	19.8179	19.8788	19.8852	19.8852	19.8622	19.6531	19.2068	18.7877 (90)
Living area fraction												
MIT	19.0129	19.1618	19.4846	19.8253	20.0217	20.0894	20.0977	20.0977	20.0693	19.8463	19.3925	18.9715 (91)
Temperature adjustment												
adjusted MIT	19.0129	19.1618	19.4846	19.8253	20.0217	20.0894	20.0977	20.0977	20.0693	19.8463	19.3925	18.9715 (92)
												0.0000
												18.9715 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9539	0.9344	0.8781	0.7594	0.5869	0.3624	0.2249	0.2270	0.4939	0.7881	0.9205	0.9605 (94)
Useful gains	593.6997	647.3217	701.2351	691.6372	556.2081	358.1522	207.4260	198.7546	388.3259	533.0174	562.0286	560.8047 (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												
	1163.6219	1141.8414	1031.0388	843.7065	600.4823	363.4501	208.0075	199.3307	405.0796	672.0217	936.2949	1151.3593 (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												
	424.0221	332.3173	245.3740	109.4899	32.9400	0.0000	0.0000	0.0000	0.0000	103.4192	269.4717	439.3726 (98)
Space heating												1956.4068 (98)
Space heating per m2												(98) / (4) = 28.0288 (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												2157.0086	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	424.0221	332.3173	245.3740	109.4899	32.9400	0.0000	0.0000	0.0000	0.0000	103.4192	269.4717	439.3726	(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)	467.4996	366.3917	270.5336	120.7165	36.3175	0.0000	0.0000	0.0000	0.0000	114.0234	297.1022	484.4241	(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	173.8323	152.9124	159.8864	142.3541	138.7957	123.0081	117.1805	129.9073	130.0974	147.6680	157.3669	169.3239	(64)
Efficiency of water heater	89.5921	89.5005	89.2033	88.5708	87.6861	87.0000	87.0000	87.0000	87.0000	88.4868	89.2998	87.0000	(216)
(217)m	89.5921	89.5005	89.2033	88.5708	87.6861	87.0000	87.0000	87.0000	87.0000	88.4868	89.2998	89.6395	(217)
Fuel for water heating, kWh/month	194.0263	170.8509	179.2383	160.7234	158.2870	141.3886	134.6902	149.3187	149.5373	166.8814	176.2231	188.8943	(219)
Water heating fuel used	194.0263	170.8509	179.2383	160.7234	158.2870	141.3886	134.6902	149.3187	149.5373	166.8814	176.2231	1970.0594	(219)
Annual totals kWh/year													
Space heating fuel - main system												2157.0086	(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)												90.4868	(230a)
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												165.4868	(231)
Electricity for lighting (calculated in Appendix L)												310.9286	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.76 * 966 * 1.00) =											-587.1990	-587.1990	(233)
Total delivered energy for all uses												4016.2844	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2157.0086	3.6300	78.2994 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1970.0594	3.6300	71.5132 (247)
Mechanical ventilation fans	90.4868	19.4400	17.5906 (249)
Pumps and fans for heating	75.0000	19.4400	14.5800 (249)
Energy for lighting	310.9286	19.4400	60.4445 (250)
Additional standing charges			95.0000 (251)
Energy saving/generation technologies			
PV Unit	-587.1990	19.4400	-114.1515 (252)
Total energy cost			223.2762 (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	2157.0086	0.2160	465.9139 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1970.0594	0.2160	425.5328 (264)
Space and water heating			891.4467 (265)
Pumps and fans	165.4868	0.5190	85.8876 (267)
Energy for lighting	310.9286	0.5190	161.3720 (268)
Energy saving/generation technologies			
PV Unit	-587.1990	0.5190	-304.7563 (269)
Total kg/year			833.9500 (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	2157.0086	1.2200	2631.5505 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1970.0594	1.2200	2403.4725 (264)
Space and water heating			5035.0230 (265)
Pumps and fans	165.4868	3.0700	508.0444 (267)
Energy for lighting	310.9286	3.0700	954.5509 (268)
Energy saving/generation technologies			

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

PV Unit	-587.1990	3.0700	-1802.7008 (269)
Primary energy kWh/year			4694.9174 (272)
Primary energy kWh/m2/year			67.2624 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:	B 86
Current environmental impact rating:	B 88

(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 (22.1%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£26 2.64 kg/m²	B 87	B 90
Total Savings	£26 2.64 kg/m²		
Potential energy efficiency rating:		B 87	
Potential environmental impact rating:			B 90

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	£93	£102	-£10
Mains gas	£245	£210	£35
Space heating	£205	£205	£0
Water heating	£72	£46	£26
Lighting	£60	£60	£0
Generated (PV)	-£114	-£114	£0
Total cost of fuels	£224	£198	£25
Total cost of uses	£223	£197	£26
Delivered energy	58 kWh/m²	44 kWh/m²	13 kWh/m²
Carbon dioxide emissions	0.8 tonnes	0.7 tonnes	0.2 tonnes
CO2 emissions per m²	12 kg/m²	9 kg/m²	3 kg/m²
Primary energy	67 kWh/m²	52 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	34.9000 (1b)	x 2.3900 (2b)	= 83.4110 (1b) - (3b)
First floor	34.9000 (1c)	x 2.6700 (2c)	= 93.1830 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 176.5940 (5)

2. Ventilation rate

										main	secondary	other	total	m3 per hour			
										heating	heating						
Number of chimneys										0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues										0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans																0 * 10 =	0.0000 (7a)
Number of passive vents																0 * 10 =	0.0000 (7b)
Number of flueless gas fires																0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans										= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) =		0.0000 (8)	
Pressure test														Yes			
Measured/design AP50														4.1700			
Infiltration rate														0.2085 (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) =				0.1929 (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																	
	0.2459	0.2411	0.2363	0.2121	0.2073	0.1832	0.1832	0.1784	0.1929	0.2073	0.2170	0.2266 (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)			14.5400	1.1450	16.6489		(27)
Ground Floor			34.9000	0.1200	4.1880	84.0000	2931.6000 (28a)
Brick and Block	124.3200	16.6600	107.6600	0.2400	25.8384	42.2200	4545.4052 (29a)
Pitched Roof	34.9000		34.9000	0.1000	3.4900	9.1000	317.5900 (30)
Total net area of external elements Aum(A, m ²)			194.1200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	52.4973		(33)
GF Stud			18.5500			9.0000	166.9500 (32c)
First Floor			66.1200			9.0000	595.0800 (32c)
GF Block			42.6000			75.0000	3195.0000 (32c)
Internal Floor 1			34.9000			18.0000	628.2000 (32d)
Internal Ceiling 1			34.9000			18.0000	628.2000 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 13008.0252 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							186.3614 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.1189 (36)
Total fabric heat loss						(33) + (36) =	57.6161 (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	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380 (38)
Heat transfer coeff	86.7541	86.7541	86.7541	86.7541	86.7541	86.7541	86.7541	86.7541	86.7541	86.7541	86.7541	86.7541 (39)
Average = Sum(39)m / 12 =												86.7541 (39)
HLP	1.2429	1.2429	1.2429	1.2429	1.2429	1.2429	1.2429	1.2429	1.2429	1.2429	1.2429	1.2429 (40)
HLP (average)												1.2429 (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	2.2413 (42)
Average daily hot water use (litres/day)	87.4299 (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	96.1729	92.6757	89.1785	85.6813	82.1841	78.6869	78.6869	82.1841	85.6813	89.1785	92.6757	96.1729 (44)
Energy content (annual)	142.6216	124.7378	128.7182	112.2197	107.6774	92.9175	86.1017	98.8029	99.9830	116.5205	127.1912	138.1214 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum (45)m =		1375.6130 (45)
	21.3932	18.7107	19.3077	16.8330	16.1516	13.9376	12.9153	14.8204	14.9974	17.4781	19.0787	20.7182 (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	31.2107	28.1746	31.1682	30.1344	31.1182	30.0906	31.0788	31.1044	30.1145	31.1475	30.1757	31.2025 (61)
Total heat required for water heating calculated for each month	173.8323	152.9124	159.8864	142.3541	138.7957	123.0081	117.1805	129.9073	130.0974	147.6680	157.3669	169.3239 (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												1.3184 (H8)
Utilisation factor												0.5316 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												87.4299 (H14)
Volume ratio Veff/V												0.8578 (H15)
Solar storage volume factor												0.9693 (H16)
Solar input	-23.8301	-39.7656	-67.7253	-90.7652	-112.1328	-110.2444	-108.7875	-95.0482	-74.4418	-50.8350	-28.2659	-821.7834 (H17)
Solar input (sum of months) = Sum (63)m =												-19.9417 (63)
Output from w/h	150.0023	113.1468	92.1611	51.5888	26.6629	12.7637	8.3930	34.8591	55.6556	96.8330	129.1010	149.3822 (64)
Total per year (kWh/year) = Sum (64)m =												920.5496 (64)
Heat gains from water heating, kWh/month	55.2244	48.5190	50.5909	44.8466	43.5823	38.4177	36.3985	40.6281	40.7729	46.5299	49.8350	53.7260 (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	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	44.0152	39.0939	31.7933	24.0696	17.9923	15.1898	16.4132	21.3344	28.6350	36.3588	42.4360	45.2385 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	293.7759	296.8243	289.1423	272.7881	252.1439	232.7412	219.7790	216.7306	224.4126	240.7668	261.4110	280.8137 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888 (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)	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504 (71)
Water heating gains (Table 5)	74.2263	72.2008	67.9985	62.2870	58.5784	53.3579	48.9227	54.6076	56.6291	62.5402	69.2153	72.2124 (72)
Total internal gains	510.5313	506.6331	487.4480	457.6587	427.2285	399.8030	383.6289	391.1866	408.1908	438.1798	471.5764	496.7785 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W			
East				6.9400	19.6403	0.6300		0.7000		0.7700		41.6561 (76)			
West				7.6000	19.6403	0.6300		0.7000		0.7700		45.6176 (80)			
Solar gains				87.2737	170.7259	281.1613	410.0570	502.5402	514.4393	489.7672	420.7028	327.0022	202.5807	108.8201	71.7697 (83)
Total gains				597.8051	677.3590	768.6093	867.7156	929.7687	914.2423	873.3962	811.8894	735.1930	640.7605	580.3964	568.5482 (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	41.6504	41.6504	41.6504	41.6504	41.6504	41.6504	41.6504	41.6504	41.6504	41.6504	41.6504	41.6504
alpha	3.7767	3.7767	3.7767	3.7767	3.7767	3.7767	3.7767	3.7767	3.7767	3.7767	3.7767	3.7767
util living area	0.9789	0.9654	0.9331	0.8586	0.7313	0.5674	0.4260	0.4738	0.7029	0.9011	0.9662	0.9824 (86)
MIT	19.5755	19.7747	20.1080	20.4974	20.7907	20.9397	20.9841	20.9763	20.8650	20.4642	19.9359	19.5172 (87)
Th 2	19.8858	19.8858	19.8858	19.8858	19.8858	19.8858	19.8858	19.8858	19.8858	19.8858	19.8858	19.8858 (88)
util rest of house	0.9739	0.9573	0.9173	0.8260	0.6737	0.4824	0.3232	0.3668	0.6216	0.8704	0.9567	0.9781 (89)
MIT 2	18.6158	18.8109	19.1333	19.4960	19.7477	19.8569	19.8812	19.8783	19.8117	19.4770	18.9721	18.5584 (90)
Living area fraction									fLA = Living area / (4) =			0.1913 (91)
MIT	18.7994	18.9952	19.3197	19.6876	19.9472	20.0640	20.0921	20.0883	20.0132	19.6658	19.1564	18.7418 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7994	18.9952	19.3197	19.6876	19.9472	20.0640	20.0921	20.0883	20.0132	19.6658	19.1564	18.7418 (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	0.9675	0.9490	0.9077	0.8194	0.6772	0.4967	0.3427	0.3869	0.6318	0.8631	0.9488	0.9723	(94)
Useful gains	578.3534	642.8463	697.6410	711.0439	629.5995	454.0587	299.3063	314.1464	464.4650	553.0475	550.6772	552.8052	(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	1257.8784	1222.8198	1112.1651	935.8650	715.4763	474.0270	302.9582	319.9727	512.9914	786.4930	1045.9453	1261.5613	(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	505.5666	389.7422	308.4060	161.8712	63.8923	0.0000	0.0000	0.0000	0.0000	173.6835	356.5930	527.3145	(98)
Space heating												2487.0694	(98)
Space heating per m2												35.6314	(99)
											(98) / (4) =		

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													2742.0831 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	505.5666	389.7422	308.4060	161.8712	63.8923	0.0000	0.0000	0.0000	0.0000	173.6835	356.5930	527.3145	(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)	557.4053	429.7047	340.0286	178.4688	70.4436	0.0000	0.0000	0.0000	0.0000	191.4923	393.1566	581.3832	(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	150.0023	113.1468	92.1611	51.5888	26.6629	12.7637	8.3930	34.8591	55.6556	96.8330	129.1010	149.3822	(64)
Efficiency of water heater	89.8259	89.8403	89.8211	89.7772	89.5783	87.0000	87.0000	87.0000	87.0000	89.3399	89.6861	87.0000	(216)
(217)m	89.8259	89.8403	89.8211	89.7772	89.5783	87.0000	87.0000	87.0000	87.0000	89.3399	89.6861	89.8564	(217)
Fuel for water heating, kWh/month	166.9922	125.9421	102.6052	57.4631	29.7649	14.6709	9.6471	40.0680	63.9720	108.3872	143.9475	166.2455	(219)
Water heating fuel used												1029.7057	(219)
Annual totals kWh/year													
Space heating fuel - main system												2742.0831	(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)													90.4868 (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													215.4868 (231)
Electricity for lighting (calculated in Appendix L)													310.9286 (232)
Energy saving/generation technologies (Appendices M, N and Q)													
PV Unit 0 (0.80 * 0.76 * 853 * 1.00) =										-518.6422		-518.6422	(233)
Total delivered energy for all uses												3779.5620	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2742.0831	3.4800	95.4245 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1029.7057	3.4800	35.8338 (247)
Mechanical ventilation fans	90.4868	13.1900	11.9352 (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	310.9286	13.1900	41.0115 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-518.6422	13.1900	-68.4089 (252)
Total energy cost			252.2835 (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] =	0.9230 (257)
SAP value		87.1243
SAP rating (Section 12)		87 (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	2742.0831	0.2160	592.2900 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1029.7057	0.2160	222.4164 (264)
Space and water heating			814.7064 (265)
Pumps and fans	215.4868	0.5190	111.8376 (267)
Energy for lighting	310.9286	0.5190	161.3720 (268)
Energy saving/generation technologies			
PV Unit	-518.6422	0.5190	-269.1753 (269)
Total kg/year			818.7407 (272)
CO2 emissions per m2			11.7300 (273)
EI value			90.4433
EI rating			90 (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	34.9000 (1b)	x 2.3900 (2b)	= 83.4110 (1b) - (3b)
First floor	34.9000 (1c)	x 2.6700 (2c)	= 93.1830 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 176.5940 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					4.1700
Infiltration rate					0.2085 (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) =		0.1929 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000 (22)
Wind factor	1.1750	1.1000	1.1000	1.0000	1.0250	0.9750	0.9750	0.9500	0.9500	1.0250	1.0000	1.0250 (22a)
Adj infilt rate	0.2266	0.2121	0.2121	0.1929	0.1977	0.1880	0.1880	0.1832	0.1832	0.1977	0.1929	0.1977 (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)			14.5400	1.1450	16.6489		(27)
Ground Floor			34.9000	0.1200	4.1880	84.0000	2931.6000 (28a)
Brick and Block	124.3200	16.6600	107.6600	0.2400	25.8384	42.2200	4545.4052 (29a)
Pitched Roof	34.9000		34.9000	0.1000	3.4900	9.1000	317.5900 (30)
Total net area of external elements Aum(A, m ²)			194.1200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		52.4973		(33)
GF Stud			18.5500			9.0000	166.9500 (32c)
First Floor			66.1200			9.0000	595.0800 (32c)
GF Block			42.6000			75.0000	3195.0000 (32c)
Internal Floor 1			34.9000			18.0000	628.2000 (32d)
Internal Ceiling 1			34.9000			18.0000	628.2000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13008.0252 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							186.3614 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.1189 (36)
Total fabric heat loss						(33) + (36) =	57.6161 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380 (38)
Average = Sum(39)m / 12 =	86.7541	86.7541	86.7541	86.7541	86.7541	86.7541	86.7541	86.7541	86.7541	86.7541	86.7541	86.7541 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2429	1.2429	1.2429	1.2429	1.2429	1.2429	1.2429	1.2429	1.2429	1.2429	1.2429	1.2429 (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												2.2413 (42)
Average daily hot water use (litres/day)												87.4299 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Energy conte	96.1729	92.6757	89.1785	85.6813	82.1841	78.6869	78.6869	82.1841	85.6813	89.1785	92.6757	96.1729 (44)
Energy content (annual)	142.6216	124.7378	128.7182	112.2197	107.6774	92.9175	86.1017	98.8029	99.9830	116.5205	127.1912	138.1214 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum (45)m =		1375.6130 (45)
	21.3932	18.7107	19.3077	16.8330	16.1516	13.9376	12.9153	14.8204	14.9974	17.4781	19.0787	20.7182 (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	31.2107	28.1746	31.1682	30.1344	31.1182	30.0906	31.0788	31.1044	30.1145	31.1475	30.1757	31.2025 (61)
Total heat required for water heating calculated for each month	173.8323	152.9124	159.8864	142.3541	138.7957	123.0081	117.1805	129.9073	130.0974	147.6680	157.3669	169.3239 (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												1.4729 (H8)
Utilisation factor												0.4928 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												87.4299 (H14)
Volume ratio Veff/V												0.8578 (H15)
Solar storage volume factor												0.9693 (H16)
Solar input												-851.0989 (H17)
Solar input	-27.7724	-39.4955	-68.5349	-92.1910	-107.1322	-116.5288	-110.4870	-100.7535	-78.8595	-54.5049	-32.8485	-21.9906 (63)
								Solar input (sum of months) =	Sum (63)m =			-851.0989 (63)
Output from w/h	146.0599	113.4168	91.3515	50.1630	31.6635	6.4793	6.6935	29.1538	51.2379	93.1631	124.5184	147.3333 (64)
								Total per year (kWh/year) =	Sum (64)m =			891.2341 (64)
Heat gains from water heating, kWh/month	55.2244	48.5190	50.5909	44.8466	43.5823	38.4177	36.3985	40.6281	40.7729	46.5299	49.8350	53.7260 (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	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	44.0152	39.0939	31.7933	24.0696	17.9923	15.1898	16.4132	21.3344	28.6350	36.3588	42.4360	45.2385 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	293.7759	296.8243	289.1423	272.7881	252.1439	232.7412	219.7790	216.7306	224.4126	240.7668	261.4110	280.8137 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888 (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)	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504 (71)
Water heating gains (Table 5)	74.2263	72.2008	67.9985	62.2870	58.5784	53.3579	48.9227	54.6076	56.6291	62.5402	69.2153	72.2124 (72)
Total internal gains	510.5313	506.6331	487.4480	457.6587	427.2285	399.8030	383.6289	391.1866	408.1908	438.1798	471.5764	496.7785 (73)

6. Solar gains

[Jan]			Area	Solar flux	g	FF	Access	Gains				
			m2	Table 6a	Specific data	Specific data	factor	W				
				W/m2	or Table 6b	or Table 6c	Table 6d					
East			6.9400	25.1733	0.6300	0.7000	0.7700	53.3913 (76)				
West			7.6000	25.1733	0.6300	0.7000	0.7700	58.4689 (80)				
Solar gains	111.8602	186.1437	311.0982	453.1011	520.4461	588.5912	538.7456	484.3497	377.9988	238.1263	139.0199	87.0706 (83)
Total gains	622.3915	692.7767	798.5463	910.7597	947.6746	988.3941	922.3745	875.5364	786.1896	676.3061	610.5963	583.8491 (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	41.6504	41.6504	41.6504	41.6504	41.6504	41.6504	41.6504	41.6504	41.6504	41.6504	41.6504	41.6504
alpha	3.7767	3.7767	3.7767	3.7767	3.7767	3.7767	3.7767	3.7767	3.7767	3.7767	3.7767	3.7767
util living area	0.9694	0.9545	0.9091	0.8052	0.6484	0.4355	0.3078	0.3142	0.5753	0.8396	0.9454	0.9743 (86)
MIT	19.7914	19.9442	20.2799	20.6499	20.8831	20.9802	20.9961	20.9959	20.9447	20.6630	20.1777	19.7488 (87)
Th 2	19.8858	19.8858	19.8858	19.8858	19.8858	19.8858	19.8858	19.8858	19.8858	19.8858	19.8858	19.8858 (88)
util rest of house	0.9616	0.9434	0.8874	0.7620	0.5778	0.3455	0.2052	0.2063	0.4768	0.7902	0.9293	0.9676 (89)
MIT 2	18.8288	18.9768	19.2965	19.6302	19.8179	19.8788	19.8852	19.8852	19.8622	19.6531	19.2068	18.7877 (90)
Living area fraction									fLA = Living area / (4) =			0.1913 (91)
MIT	19.0129	19.1618	19.4846	19.8253	20.0217	20.0894	20.0977	20.0977	20.0693	19.8463	19.3925	18.9715 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0129	19.1618	19.4846	19.8253	20.0217	20.0894	20.0977	20.0977	20.0693	19.8463	19.3925	18.9715 (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	0.9539	0.9344	0.8781	0.7594	0.5869	0.3624	0.2249	0.2270	0.4939	0.7881	0.9205	0.9605	(94)
Useful gains	593.6997	647.3217	701.2351	691.6372	556.2081	358.1522	207.4260	198.7546	388.3259	533.0174	562.0286	560.8047	(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	1163.6219	1141.8414	1031.0388	843.7065	600.4823	363.4501	208.0075	199.3307	405.0796	672.0217	936.2949	1151.3593	(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	424.0221	332.3173	245.3740	109.4899	32.9400	0.0000	0.0000	0.0000	0.0000	103.4192	269.4717	439.3726	(98)
Space heating												1956.4068	(98)
Space heating per m2												28.0288	(99)
											(98) / (4) =		

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													2157.0086 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	424.0221	332.3173	245.3740	109.4899	32.9400	0.0000	0.0000	0.0000	0.0000	103.4192	269.4717	439.3726	(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)	467.4996	366.3917	270.5336	120.7165	36.3175	0.0000	0.0000	0.0000	0.0000	114.0234	297.1022	484.4241	(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	146.0599	113.4168	91.3515	50.1630	31.6635	6.4793	6.6935	29.1538	51.2379	93.1631	124.5184	147.3333	(64)
Efficiency of water heater	89.7224	89.7290	89.6655	89.5040	88.8480	87.0000	87.0000	87.0000	87.0000	88.9081	89.4971	87.0000	(216)
(217)m	89.7224	89.7290	89.6655	89.5040	88.8480	87.0000	87.0000	87.0000	87.0000	88.9081	89.4971	87.0000	(217)
Fuel for water heating, kWh/month	162.7910	126.3993	101.8804	56.0456	35.6378	7.4475	7.6936	33.5102	58.8942	104.7859	139.1313	164.1750	(219)
Water heating fuel used												998.3917	(219)
Annual totals kWh/year													
Space heating fuel - main system												2157.0086	(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)													90.4868 (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													215.4868 (231)
Electricity for lighting (calculated in Appendix L)													310.9286 (232)
Energy saving/generation technologies (Appendices M, N and Q)													
PV Unit 0 (0.80 * 0.76 * 966 * 1.00) =										-587.1990		-587.1990	(233)
Total delivered energy for all uses												3094.6167	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2157.0086	3.6300	78.2994 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	998.3917	3.6300	36.2416 (247)
Mechanical ventilation fans	90.4868	19.4400	17.5906 (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	310.9286	19.4400	60.4445 (250)
Additional standing charges			95.0000 (251)
Energy saving/generation technologies			
PV Unit	-587.1990	19.4400	-114.1515 (252)
Total energy cost			197.7247 (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	2157.0086	0.2160	465.9139 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	998.3917	0.2160	215.6526 (264)
Space and water heating			681.5665 (265)
Pumps and fans	215.4868	0.5190	111.8376 (267)

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 for lighting	310.9286	0.5190	161.3720 (268)
Energy saving/generation technologies			
PV Unit	-587.1990	0.5190	-304.7563 (269)
Total kg/year			650.0198 (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	2157.0086	1.2200	2631.5505 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	998.3917	1.2200	1218.0379 (264)
Space and water heating			3849.5883 (265)
Pumps and fans	215.4868	3.0700	661.5444 (267)
Energy for lighting	310.9286	3.0700	954.5509 (268)
Energy saving/generation technologies			
PV Unit	-587.1990	3.0700	-1802.7008 (269)
Primary energy kWh/year			3662.9827 (272)
Primary energy kWh/m2/year			52.4783 (273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0647 Plot 72	Issued on Date	01/03/2022
Assessment Reference	As Built	Prop Type Ref	T (HA/SO/AR)
Project	8 Shaw Road, West End, Southampton, SO30 3JZ		
Calculation Type	New Build (As Built)		

SAP Rating	86 B	DER	16.12	TER	20.50
Environmental	88 B	% DER<TER	21.38		
CO ₂ Emissions (t/year)	0.83	DFEE	50.44	TREE	61.03
General Requirements Compliance	Pass	% DFEE<TFEE	17.35		

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 72	Issued on Date	01/03/2022
Assessment Reference	As Built	Prop Type Ref	T (HA/SO/AR)
Project	8 Shaw Road, West End, Southampton, SO30 3JZ		
Calculation Type	New Build (As Built)		

SAP Rating	86 B	DER	16.12	TER	20.50
Environmental	88 B	% DER<TER	21.38		
CO ₂ Emissions (t/year)	0.83	DFEE	50.44	TFEE	61.03
General Requirements Compliance	Pass	% DFEE<TFEE	17.35		

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

Wall 000001

Wall Type: Standard Wall

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

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

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

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0647 Plot 72	Issued on Date	01/03/2022
Assessment Reference	As Built	Prop Type Ref	T (HA/SO/AR)
Project	8 Shaw Road, West End, Southampton, SO30 3JZ		
Calculation Type	New Build (As Built)		

SAP Rating	86 B	DER	16.12	TER	20.50
Environmental	88 B	% DER<TER	21.38		
CO ₂ Emissions (t/year)	0.83	DFEE	50.44	TFEE	61.03
General Requirements Compliance	Pass	% DFEE<TFEE	17.35		

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 72	Issued on Date	01/03/2022
Assessment Reference	As Built	Prop Type Ref	T (HA/SO/AR)
Property	8 Shaw Road, West End, Southampton, SO30 3JZ		
SAP Rating	86 B	DER	16.12
Environmental	88 B	TER	20.50
CO ₂ Emissions (t/year)	0.83	% DER<TER	21.38
General Requirements Compliance	Pass	DFEE	50.44
		TFEE	61.03
		% DFEE<TFEE	17.35
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	East
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Suburban
1.0 Property Type	House, Detached
2.0 Number of Storeys	2
3.0 Date Built	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:	24.57 m	34.90 m ²
	1st Storey:	24.57 m	34.90 m ²
			2.39 m
			2.67 m

7.0 Living Area	13.35	m ²
8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	186.36	kJ/m ² K

9.0 External Walls			U-Value	Kappa	Gross Area	Nett Area
Description	Type	Construction	(W/m ² K)	(kJ/m ² K)	(m ²)	(m ²)
Brick and Block	Cavity Wall	Other	0.24	42.22	124.32	107.66

9.1 Party Walls			U-Value	Kappa	Area
Description	Type	Construction	(W/m ² K)	(kJ/m ² K)	(m ²)
		Single plasterboard on dabs on both sides, dense blocks, cavity or cavity fill		70.00	

9.2 Internal Walls			Kappa	Area
Description	Construction		(kJ/m ² K)	(m ²)
GF Stud	Plasterboard on timber frame		9.00	18.55
First Floor	Plasterboard on timber frame		9.00	66.12
GF Block	Dense block, plasterboard on dabs		75.00	42.60

10.0 External Roofs			U-Value	Kappa	Gross Area	Nett Area
Description	Type	Construction	(W/m ² K)	(kJ/m ² K)	(m ²)	(m ²)
Pitched Roof	External Plane Roof	Other	0.10	9.10	34.90	34.90

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	34.90

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	34.90

11.2 Internal Floors

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	Plasterboard ceiling, carpeted chipboard floor	18.00	34.90

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	East							2.12	
Front Elevation	Window	[1] Brick and Block	East	None	0.00					6.94	
Rear Elevation	Window	[1] Brick and Block	West	None	0.00					7.60	

14.0 Conservatory

15.0 Draught Proofing

 %

16.0 Draught Lobby

17.0 Thermal Bridging

17.1 List of Bridges

Source Type	Bridge Type	Length	Psi	Imported	Reference:
Independently assessed	E2 Other lintels (including other steel lintels)	1.92	0.053	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	6.64	0.043	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	3.02	0.043	No	Birtley Supatherm
Independently assessed	E3 Sill	7.55	0.034	No	CD0027
Independently assessed	E4 Jamb	25.50	0.039	No	CD0028
Independently assessed	E5 Ground floor (normal)	24.57	0.037	No	Knauf P7
Independently assessed	E6 Intermediate floor within a dwelling	24.57	0.000	No	CD0029
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	15.82	0.060	No	
Independently assessed	E12 Gable (insulation at ceiling level)	8.93	0.054	No	CD0031
Independently assessed	E16 Corner (normal)	20.20	0.050	No	CD0035

Y-value	0.026	W/m²K
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18.0 Pressure Testing

Designed AP ₅₀	5.00	m³/(h.m²) @ 50 Pa
Property Tested ?	Yes	
As Built AP ₅₀	4.17	m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather	Windows half open
Cross ventilation possible	Yes
Night Ventilation	Yes

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

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 12

Total number of L.E.L. fittings 12

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

Flow Temperature Normal (> 45°C)

Combi boiler type Standard Combi

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

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
0.76	East	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 87	