



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 7 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 73	Issued on Date	01/03/2022
Assessment Reference	As Built	Prop Type Ref	T (HA/SO/AR)
Property	7 Shaw Road, West End, Southampton, SO30 3JZ		
SAP Rating	86 B	DER	16.13
Environmental	88 B	TER	20.50
CO ₂ Emissions (t/year)	0.83	% DER<TER	21.33
General Requirements Compliance	Pass	DLEE	50.45
		TFEE	61.02
		% DLEE<TFEE	17.32
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)	16.13	kgCO ₂ /m ²	Pass
	-4.37 (-21.3%)	kgCO ₂ /m ²	

1b TFEE and DLEE

Target Fabric Energy Efficiency (TFEE)	61.02	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DLEE)	50.45	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	4.14 (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

4.14 (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	0.027	W/m ² K
Photovoltaic array	0.76	kW

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THERMAL BRIDGING

Calculation Type: New Build (As Built)

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Property	7 Shaw Road, West End, Southampton, SO30 3JZ		

SAP Rating	86 B	DER	16.13	TER	20.50
Environmental	88 B	% DER<TER	21.33		
CO ₂ Emissions (t/year)	0.83	DFEE	50.45	TFEE	61.02
General Requirements Compliance	Pass	% DFEE<TFEE	17.32		

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	0.060	3.02	0.18	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	8.75	0.47	CD0031
External wall	E16 Corner (normal)	Independently assessed	0.050	20.20	1.01	CD0035

Total: **5.16** W/mK:
Y-Value: **0.027** 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) 16.13 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: 4.14 (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 m², No overhang
Windows facing West: 7.60 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.10 W/m²K
Floor U-value 0.12 W/m²K
Door U-value 1.10 W/m²K
Thermal bridging y-value 0.027 W/m²K
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												4.1400
Infiltration rate												0.2070 (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) =	0.1915 (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												
	0.2441	0.2393	0.2346	0.2106	0.2058	0.1819	0.1819	0.1771	0.1915	0.2058	0.2154	0.2250 (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)							5.1605 (36)
Total fabric heat loss						(33) + (36) =	57.6577 (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	86.7957	86.7957	86.7957	86.7957	86.7957	86.7957	86.7957	86.7957	86.7957	86.7957	86.7957	86.7957 (39)
Average = Sum(39)m / 12 =												86.7957 (39)
HLP	1.2435	1.2435	1.2435	1.2435	1.2435	1.2435	1.2435	1.2435	1.2435	1.2435	1.2435	1.2435 (40)
HLP (average)												1.2435 (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	41.6304	41.6304	41.6304	41.6304	41.6304	41.6304	41.6304	41.6304	41.6304	41.6304	41.6304	
alpha	3.7754	3.7754	3.7754	3.7754	3.7754	3.7754	3.7754	3.7754	3.7754	3.7754	3.7754	
util living area												
0.9925	0.9851	0.9646	0.9081	0.7957	0.6356	0.4876	0.5462	0.7865	0.9488	0.9868	0.9940	(86)
MIT	19.3223	19.5353	19.9030	20.3527	20.7144	20.9114	20.9750	20.9618	20.7971	20.2946	19.7097	19.2669 (87)
Th 2	19.8854	19.8854	19.8854	19.8854	19.8854	19.8854	19.8854	19.8854	19.8854	19.8854	19.8854	19.8854 (88)
util rest of house												
0.9906	0.9813	0.9552	0.8835	0.7430	0.5472	0.3730	0.4280	0.7115	0.9300	0.9828	0.9925	(89)
MIT 2	18.3658	18.5770	18.9384	19.3683	19.6901	19.8412	19.8778	19.8726	19.7672	19.3240	18.7517	18.3108 (90)
Living area fraction												
fLA = Living area / (4) =												0.1913 (91)
MIT	18.5488	18.7603	19.1229	19.5566	19.8860	20.0459	20.0876	20.0809	19.9641	19.5096	18.9349	18.4937 (92)
Temperature adjustment												0.0000
adjusted MIT	18.5488	18.7603	19.1229	19.5566	19.8860	20.0459	20.0876	20.0809	19.9641	19.5096	18.9349	18.4937 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.9873	0.9761	0.9470	0.8749	0.7430	0.5608	0.3946	0.4499	0.7175	0.9219	0.9780	0.9897	(94)
Useful gains	430.0294	504.6737	582.6162	633.7345	592.1129	442.7422	296.8134	309.8134	434.1294	461.5171	420.3114	405.6283 (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												
1236.7336	1203.0112	1095.6138	924.9448	710.5129	472.6825	302.7128	319.4876	508.9831	773.3194	1027.2209	1240.6302	(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												
600.1879	469.2829	381.6702	209.6715	88.0896	0.0000	0.0000	0.0000	0.0000	231.9809	436.9749	621.2414	(98)
Space heating												3039.0992 (98)
Space heating per m2												(98) / (4) = 43.5401 (99)

FULL SAP CALCULATION PRINTOUT

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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												3350.7157 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	600.1879	469.2829	381.6702	209.6715	88.0896	0.0000	0.0000	0.0000	0.0000	231.9809	436.9749	621.2414 (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)	661.7286	517.4012	420.8051	231.1703	97.1219	0.0000	0.0000	0.0000	0.0000	255.7672	481.7805	684.9409 (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	89.8419	89.7618	89.5753	89.1665	88.4001	87.0000	87.0000	87.0000	87.0000	89.2241	89.6900	87.0000 (216)
Fuel for water heating, kWh/month	193.4869	170.3535	178.4939	159.6497	157.0085	141.3886	134.6902	149.3187	149.5373	165.5025	175.4564	188.3862 (219)
Water heating fuel used												1963.2723 (219)
Annual totals kWh/year												
Space heating fuel - main system												3350.7157 (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												5271.7612 (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	3350.7157	0.2160	723.7546 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1963.2723	0.2160	424.0668 (264)
Space and water heating			1147.8214 (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			1125.9057 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			16.1300 (273)

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

DER			16.1300 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			35.3157 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			35.3157 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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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)										9.4549 (36)			
Total fabric heat loss									(33) + (36) =	59.3042 (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	34.4859	34.2783	34.0747	33.1186	32.9397	32.1070	32.1070	31.9528	32.4278	32.9397	33.3016	33.6799	(38)
Average = Sum(39)m / 12 =	93.7901	93.5825	93.3789	92.4228	92.2440	91.4112	91.4112	91.2570	91.7320	92.2440	92.6058	92.9842	(39)
												92.4220	(39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.3437	1.3407	1.3378	1.3241	1.3215	1.3096	1.3096	1.3074	1.3142	1.3215	1.3267	1.3322	(40)
Days in month												1.3241	(40)
	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 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	Total = Sum(45)m = 1375.6130 (45)											
	(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												

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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	51.6816	51.7963	51.9092	52.4462	52.5479	53.0265	53.0265	53.1162	52.8411	52.5479	52.3425	52.1296	
alpha	4.4454	4.4531	4.4606	4.4964	4.5032	4.5351	4.5351	4.5411	4.5227	4.5032	4.4895	4.4753	
util living area	0.9974	0.9941	0.9831	0.9439	0.8454	0.6783	0.5179	0.5801	0.8342	0.9728	0.9949	0.9980	(86)
MIT	19.5367	19.7162	20.0315	20.4384	20.7637	20.9379	20.9854	20.9762	20.8371	20.3898	19.8864	19.5061	(87)
Th 2	19.8068	19.8091	19.8113	19.8220	19.8240	19.8333	19.8333	19.8350	19.8297	19.8240	19.8200	19.8157	(88)
util rest of house	0.9965	0.9921	0.9770	0.9229	0.7903	0.5778	0.3880	0.4459	0.7538	0.9588	0.9928	0.9973	(89)
MIT 2	17.8759	18.1390	18.5970	19.1783	19.6009	19.7941	19.8284	19.8259	19.7028	19.1240	18.3958	17.8372	(90)
Living area fraction	18.1935	18.4406	18.8714	19.4193	19.8233	20.0129	20.0497	20.0459	19.9197	19.3661	18.6809	18.1564	(91)
Temperature adjustment												0.0000	
adjusted MIT	18.1935	18.4406	18.8714	19.4193	19.8233	20.0129	20.0497	20.0459	19.9197	19.3661	18.6809	18.1564	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	439.1525	516.4568	601.5047	665.8160	632.5995	471.0933	311.8121	326.4060	463.6755	480.7121	430.6257	414.0870	(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	1303.0746	1267.1644	1155.2266	972.2214	749.3227	494.7961	315.3400	332.7169	533.8540	808.6203	1072.4591	1297.7235	(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	642.7581	504.4756	411.9691	220.6119	86.8421	0.0000	0.0000	0.0000	0.0000	243.9637	462.1200	657.4255	(98)
Space heating												3230.1659	(98)
Space heating per m2												46.2774	(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													3458.4217 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	642.7581	504.4756	411.9691	220.6119	86.8421	0.0000	0.0000	0.0000	0.0000	243.9637	462.1200	657.4255	(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)	688.1778	540.1237	441.0804	236.2012	92.9787	0.0000	0.0000	0.0000	0.0000	261.2031	494.7752	703.8817	(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	87.8619	87.6532	87.1431	85.9479	83.7368	80.3000	80.3000	80.3000	80.3000	86.0800	87.4067	87.9490	(216)
Fuel for water heating, kWh/month	218.1039	190.9731	199.8581	179.7292	178.6044	164.0373	157.1602	175.1968	177.1317	188.1561	197.8044	212.7713	(219)
Water heating fuel used												2239.5265	(219)
Annual totals kWh/year													
Space heating fuel - main system												3458.4217	(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												6083.8769	(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	3458.4217	0.2160	747.0191 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2239.5265	0.2160	483.7377 (264)
Space and water heating			1230.7568 (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			1431.0538 (272)
Emissions per m2 for space and water heating			17.6326 (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) = (17.6326 * 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					4.1400
Infiltration rate					0.3203 (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) =				0.2962 (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	0.3777	0.3703	0.3629	0.3259	0.3185	0.2814	0.2814	0.2740	0.2962	0.3185	0.3333	0.3481 (22b)
Effective ac	0.5713	0.5686	0.5658	0.5531	0.5507	0.5396	0.5396	0.5375	0.5439	0.5507	0.5555	0.5606 (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) 5.1605 (36)
Total fabric heat loss (33) + (36) = 57.6577 (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	33.2948	33.1333	32.9751	32.2320	32.0930	31.4457	31.4457	31.3259	31.6950	32.0930	32.3742	32.6683 (38)
Heat transfer coeff	90.9525	90.7911	90.6329	89.8897	89.7507	89.1034	89.1034	88.9836	89.3527	89.7507	90.0320	90.3260 (39)
Average = Sum(39)m / 12 =												89.8891 (39)
HLP	1.3030	1.3007	1.2985	1.2878	1.2858	1.2766	1.2766	1.2748	1.2801	1.2858	1.2899	1.2941 (40)
HLP (average)												1.2878 (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	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)

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Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	30.3071	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	38.7685	38.8374	38.9052	39.2268	39.2876	39.5730	39.5730	39.6263	39.4626	39.2876	39.1649	39.0374	
alpha	3.5846	3.5892	3.5937	3.6151	3.6192	3.6382	3.6382	3.6418	3.6308	3.6192	3.6110	3.6025	
util living area	0.9939	0.9875	0.9696	0.9190	0.8158	0.6605	0.5127	0.5743	0.8106	0.9572	0.9893	0.9951	(86)
MIT	19.1413	19.3654	19.7552	20.2496	20.6513	20.8868	20.9660	20.9488	20.7494	20.1934	19.5705	19.0995	(87)
Th 2	19.8384	19.8403	19.8420	19.8504	19.8520	19.8592	19.8592	19.8606	19.8564	19.8520	19.8488	19.8455	(88)
util rest of house	0.9923	0.9842	0.9614	0.8965	0.7652	0.5708	0.3919	0.4510	0.7384	0.9409	0.9860	0.9939	(89)
MIT 2	18.1536	18.3775	18.7633	19.2459	19.6101	19.8017	19.8487	19.8430	19.7070	19.2040	18.5893	18.1172	(90)
Living area fraction									fLA = Living area / (4) =			0.1913	(91)
MIT	18.3425	18.5665	18.9530	19.4378	19.8092	20.0092	20.0624	20.0545	19.9063	19.3933	18.7769	18.3051	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3425	18.5665	18.9530	19.4378	19.8092	20.0092	20.0624	20.0545	19.9063	19.3933	18.7769	18.3051	(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	0.5836	0.4145	0.4734	0.7421	0.9324	0.9816	0.9914	(94)
Ext temp.	394.8034	471.3283	553.7732	613.7977	584.5075	443.7875	300.4337	312.1337	426.6692	436.6903	387.8191	370.8713	(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	1277.2034	1240.7924	1128.6502	947.2422	727.8062	481.9807	308.5100	325.1891	518.8128	789.2025	1051.2974	1274.0577	(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	656.5057	517.0799	427.7085	240.0801	106.6142	0.0000	0.0000	0.0000	0.0000	262.2691	477.7044	671.9707	(98)
Space heating per m2												3359.9324	(98)
										(98) / (4) =		48.1366	(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	837.5723	659.3654	676.2752	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8387	0.8952	0.8653	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	702.4461	590.2614	585.1969	0.0000	0.0000	0.0000	0.0000	(102)

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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	194.1950	251.8382	199.6395	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												645.6727 (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	48.5487	62.9596	49.9099	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												161.4182 (107)
Space cooling per m2												2.3126 (108)
Energy for space heating												48.1366 (99)
Energy for space cooling												2.3126 (108)
Total												50.4491 (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 heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					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					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 m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1200	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, m ²)			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/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.4549 (36)
Total fabric heat loss						(33) + (36) =	59.3042 (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	34.4859	34.2783	34.0747	33.1186	32.9397	32.1070	32.1070	31.9528	32.4278	32.9397	33.3016	33.6799 (38)
Average = Sum(39)m / 12 =	93.7901	93.5825	93.3789	92.4228	92.2440	91.4112	91.4112	91.2570	91.7320	92.2440	92.6058	92.9842 (39)
												92.4220 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.3437	1.3407	1.3378	1.3241	1.3215	1.3096	1.3096	1.3074	1.3142	1.3215	1.3267	1.3322 (40)
Days in month												1.3241 (40)
	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)
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												

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	51.6816	51.7963	51.9092	52.4462	52.5479	53.0265	53.0265	53.1162	52.8411	52.5479	52.3425	52.1296	
alpha	4.4454	4.4531	4.4606	4.4964	4.5032	4.5351	4.5351	4.5411	4.5227	4.5032	4.4895	4.4753	
util living area	0.9983	0.9958	0.9868	0.9525	0.8614	0.6987	0.5372	0.6043	0.8559	0.9793	0.9965	0.9987	(86)
MIT	19.4821	19.6640	19.9843	20.4014	20.7416	20.9299	20.9832	20.9720	20.8160	20.3467	19.8353	19.4522	(87)
Th 2	19.8068	19.8091	19.8113	19.8220	19.8240	19.8333	19.8333	19.8350	19.8297	19.8240	19.8200	19.8157	(88)
util rest of house	0.9977	0.9943	0.9818	0.9341	0.8092	0.5982	0.4036	0.4668	0.7804	0.9683	0.9951	0.9983	(89)
MIT 2	18.4340	18.6171	18.9363	19.3488	19.6550	19.8026	19.8294	19.8276	19.7292	19.3055	18.7969	18.4111	(90)
Living area fraction									fLA = Living area / (4) =			0.1913	(91)
MIT	18.6345	18.8173	19.1368	19.5501	19.8628	20.0182	20.0500	20.0465	19.9371	19.5047	18.9955	18.6102	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6345	18.8173	19.1368	19.5501	19.8628	20.0182	20.0500	20.0465	19.9371	19.5047	18.9955	18.6102	(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	0.6154	0.4294	0.4933	0.7886	0.9641	0.9936	0.9976	(94)
Ext temp.	397.7941	477.6789	568.2146	642.8912	621.3971	468.0459	311.2401	325.2048	453.4172	451.5383	392.5504	373.1851	(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	1344.4329	1302.4162	1180.0063	984.3120	752.9718	495.2845	315.3724	332.7645	535.4468	821.4007	1101.5962	1339.9224	(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	704.2993	554.2235	455.1730	245.8230	97.8916	0.0000	0.0000	0.0000	0.0000	275.1776	510.5129	719.2525	(98)
Space heating per m2												3562.3535	(98)
										(98) / (4) =		51.0366	(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	859.2656	676.4431	693.5534	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8660	0.9220	0.8931	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	744.1070	623.6711	619.4350	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	164.1991	226.9814	174.1663	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												565.3468	(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	41.0498	56.7454	43.5416	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling											141.3367 (107)
Space cooling per m2											2.0249 (108)
Energy for space heating											51.0366 (99)
Energy for space cooling											2.0249 (108)
Total											53.0615 (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	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					4.1400
Infiltration rate					0.2070 (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) =		0.1915 (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	0.2250	0.2106	0.2106	0.1915	0.1963	0.1867	0.1867	0.1819	0.1819	0.1963	0.1915	0.1963 (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)							5.1605 (36)
Total fabric heat loss						(33) + (36) =	57.6577 (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 =	86.7957	86.7957	86.7957	86.7957	86.7957	86.7957	86.7957	86.7957	86.7957	86.7957	86.7957	86.7957 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2435	1.2435	1.2435	1.2435	1.2435	1.2435	1.2435	1.2435	1.2435	1.2435	1.2435	1.2435 (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)
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)
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												
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)												
tau	41.6304	41.6304	41.6304	41.6304	41.6304	41.6304	41.6304	41.6304	41.6304	41.6304	41.6304	41.6304
alpha	3.7754	3.7754	3.7754	3.7754	3.7754	3.7754	3.7754	3.7754	3.7754	3.7754	3.7754	3.7754
util living area	0.9694	0.9545	0.9091	0.8054	0.6486	0.4357	0.3079	0.3144	0.5755	0.8397	0.9454	0.9743 (86)
MIT	19.7905	19.9434	20.2791	20.6494	20.8829	20.9801	20.9960	20.9959	20.9446	20.6625	20.1770	19.7480 (87)
Th 2	19.8854	19.8854	19.8854	19.8854	19.8854	19.8854	19.8854	19.8854	19.8854	19.8854	19.8854	19.8854 (88)
util rest of house	0.9617	0.9434	0.8874	0.7621	0.5779	0.3456	0.2052	0.2063	0.4769	0.7903	0.9294	0.9676 (89)
MIT 2	18.8275	18.9756	19.2954	19.6294	19.8173	19.8783	19.8847	19.8847	19.8617	19.6523	19.2058	18.7865 (90)
Living area fraction									fLA = Living area / (4) =			0.1913 (91)
MIT	19.0117	19.1607	19.4836	19.8245	20.0211	20.0890	20.0973	20.0973	20.0688	19.8456	19.3915	18.9704 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0117	19.1607	19.4836	19.8245	20.0211	20.0890	20.0973	20.0973	20.0688	19.8456	19.3915	18.9704 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	593.7070	647.3369	701.2778	691.7393	556.3537	358.2753	207.4902	198.8147	388.4404	533.0818	562.0461	560.8097 (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	1164.0791	1142.2901	1031.4446	844.0427	600.7232	363.5890	208.0738	199.3927	405.2348	672.2813	936.6581	1151.8114 (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	424.3569	332.6086	245.6441	109.6584	33.0109	0.0000	0.0000	0.0000	0.0000	103.5644	269.7207	439.7053 (98)
Space heating												1958.2692 (98)
RHI space heating demand												1958 (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												4.1400
Infiltration rate												0.2070 (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) =	0.1915 (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												
	0.2441	0.2393	0.2346	0.2106	0.2058	0.1819	0.1819	0.1771	0.1915	0.2058	0.2154	0.2250 (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)							5.1605 (36)
Total fabric heat loss						(33) + (36) =	57.6577 (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	86.7957	86.7957	86.7957	86.7957	86.7957	86.7957	86.7957	86.7957	86.7957	86.7957	86.7957	86.7957 (39)
Average = Sum(39)m / 12 =												86.7957 (39)
HLP	1.2435	1.2435	1.2435	1.2435	1.2435	1.2435	1.2435	1.2435	1.2435	1.2435	1.2435	1.2435 (40)
HLP (average)												1.2435 (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]					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	41.6304	41.6304	41.6304	41.6304	41.6304	41.6304	41.6304	41.6304	41.6304	41.6304	41.6304	41.6304	
alpha	3.7754	3.7754	3.7754	3.7754	3.7754	3.7754	3.7754	3.7754	3.7754	3.7754	3.7754	3.7754	
util living area													
	0.9790	0.9654	0.9332	0.8587	0.7314	0.5675	0.4262	0.4740	0.7031	0.9012	0.9662	0.9824 (86)	
MIT	19.5746	19.7738	20.1072	20.4967	20.7903	20.9396	20.9841	20.9762	20.8648	20.4636	19.9351	19.5162 (87)	
Th 2	19.8854	19.8854	19.8854	19.8854	19.8854	19.8854	19.8854	19.8854	19.8854	19.8854	19.8854	19.8854 (88)	
util rest of house													
	0.9739	0.9573	0.9174	0.8261	0.6739	0.4826	0.3233	0.3669	0.6218	0.8704	0.9568	0.9781 (89)	
MIT 2	18.6145	18.8096	19.1321	19.4951	19.7470	19.8564	19.8807	19.8778	19.8111	19.4760	18.9710	18.5571 (90)	
Living area fraction									fLA = Living area / (4) =				0.1913 (91)
MIT	18.7981	18.9940	19.3186	19.6867	19.9465	20.0636	20.0917	20.0879	20.0126	19.6649	19.1554	18.7406 (92)	
Temperature adjustment												0.0000	
adjusted MIT	18.7981	18.9940	19.3186	19.6867	19.9465	20.0636	20.0917	20.0879	20.0126	19.6649	19.1554	18.7406 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9675	0.9491	0.9077	0.8195	0.6773	0.4968	0.3428	0.3871	0.6319	0.8632	0.9488	0.9723 (94)
Useful gains	578.3567	642.8560	697.6694	711.1174	629.7288	454.1966	299.4059	314.2480	464.5695	553.0854	550.6852	552.8072 (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												
	1258.3749	1223.3018	1112.6028	936.2354	715.7630	474.2140	303.0687	320.0905	513.1903	786.7965	1046.3534	1262.0594 (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												
	505.9336	390.0596	308.7105	162.0850	64.0094	0.0000	0.0000	0.0000	0.0000	173.8810	356.8811	527.6837 (98)
Space heating												2489.2439 (98)
Space heating per m2												(98) / (4) = 35.6625 (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												2744.4806 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	505.9336	390.0596	308.7105	162.0850	64.0094	0.0000	0.0000	0.0000	0.0000	173.8810	356.8811	527.6837 (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)	557.8099	430.0547	340.3644	178.7045	70.5727	0.0000	0.0000	0.0000	0.0000	191.7101	393.4742	581.7902 (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	89.7242	89.6265	89.4027	88.9315	88.1348	87.0000	87.0000	87.0000	87.0000	88.9625	89.5348	87.0000 (216)
Fuel for water heating, kWh/month	193.7408	170.6106	178.8385	160.0716	157.4812	141.3886	134.6902	149.3187	149.5373	165.9891	175.7607	188.6144 (219)
Water heating fuel used												1966.0416 (219)
Annual totals kWh/year												
Space heating fuel - main system												2744.4806 (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												4668.2954 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2744.4806	3.4800	95.5079 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1966.0416	3.4800	68.4182 (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			278.3565 (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] =	1.0184 (257)
SAP value		85.7936
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	2744.4806	0.2160	592.8078 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1966.0416	0.2160	424.6650 (264)
Space and water heating			1017.4728 (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			995.5571 (272)
CO2 emissions per m2			14.2600 (273)
EI value			88.3794
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	=	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												4.1400
Infiltration rate												0.2070 (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) =	0.1915 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000 (22)
Wind factor	1.1750	1.1000	1.1000	1.0000	1.0250	0.9750	0.9750	0.9500	0.9500	1.0250	1.0000	1.0250 (22a)
Adj infilt rate												
	0.2250	0.2106	0.2106	0.1915	0.1963	0.1867	0.1867	0.1819	0.1819	0.1963	0.1915	0.1963 (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)							5.1605 (36)
Total fabric heat loss						(33) + (36) =	57.6577 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 29.1380	Feb 29.1380	Mar 29.1380	Apr 29.1380	May 29.1380	Jun 29.1380	Jul 29.1380	Aug 29.1380	Sep 29.1380	Oct 29.1380	Nov 29.1380	Dec 29.1380 (38)
Heat transfer coeff	86.7957	86.7957	86.7957	86.7957	86.7957	86.7957	86.7957	86.7957	86.7957	86.7957	86.7957	86.7957 (39)
Average = Sum(39)m / 12 =												86.7957 (39)
HLP	Jan 1.2435	Feb 1.2435	Mar 1.2435	Apr 1.2435	May 1.2435	Jun 1.2435	Jul 1.2435	Aug 1.2435	Sep 1.2435	Oct 1.2435	Nov 1.2435	Dec 1.2435 (40)
HLP (average)												1.2435 (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 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 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	41.6304	41.6304	41.6304	41.6304	41.6304	41.6304	41.6304	41.6304	41.6304	41.6304	41.6304	41.6304	
alpha	3.7754	3.7754	3.7754	3.7754	3.7754	3.7754	3.7754	3.7754	3.7754	3.7754	3.7754	3.7754	
util living area	0.9694	0.9545	0.9091	0.8054	0.6486	0.4357	0.3079	0.3144	0.5755	0.8397	0.9454	0.9743 (86)	
MIT	19.7905	19.9434	20.2791	20.6494	20.8829	20.9801	20.9960	20.9959	20.9446	20.6625	20.1770	19.7480 (87)	
Th 2	19.8854	19.8854	19.8854	19.8854	19.8854	19.8854	19.8854	19.8854	19.8854	19.8854	19.8854	19.8854 (88)	
util rest of house	0.9617	0.9434	0.8874	0.7621	0.5779	0.3456	0.2052	0.2063	0.4769	0.7903	0.9294	0.9676 (89)	
MIT 2	18.8275	18.9756	19.2954	19.6294	19.8173	19.8783	19.8847	19.8847	19.8617	19.6523	19.2058	18.7865 (90)	
Living area fraction									fLA = Living area / (4) =				0.1913 (91)
MIT	19.0117	19.1607	19.4836	19.8245	20.0211	20.0890	20.0973	20.0973	20.0688	19.8456	19.3915	18.9704 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.0117	19.1607	19.4836	19.8245	20.0211	20.0890	20.0973	20.0973	20.0688	19.8456	19.3915	18.9704 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9539	0.9344	0.8782	0.7595	0.5871	0.3625	0.2250	0.2271	0.4941	0.7882	0.9205	0.9605 (94)
Useful gains	593.7070	647.3369	701.2778	691.7393	556.3537	358.2753	207.4902	198.8147	388.4404	533.0818	562.0461	560.8097 (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												
	1164.0791	1142.2901	1031.4446	844.0427	600.7232	363.5890	208.0738	199.3927	405.2348	672.2813	936.6581	1151.8114 (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												
	424.3569	332.6086	245.6441	109.6584	33.0109	0.0000	0.0000	0.0000	0.0000	103.5644	269.7207	439.7053 (98)
Space heating												1958.2692 (98)
Space heating per m2												(98) / (4) = 28.0554 (99)

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8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2159.0619 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	424.3569	332.6086	245.6441	109.6584	33.0109	0.0000	0.0000	0.0000	0.0000	103.5644	269.7207	439.7053	(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)	467.8686	366.7129	270.8314	120.9024	36.3957	0.0000	0.0000	0.0000	0.0000	114.1834	297.3767	484.7908	(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	89.5927	89.5012	89.2043	88.5722	87.6873	87.0000	87.0000	87.0000	87.0000	88.4880	89.3006	87.0000	(216)
(217)m	89.5927	89.5012	89.2043	88.5722	87.6873	87.0000	87.0000	87.0000	87.0000	88.4880	89.3006	89.6401	(217)
Fuel for water heating, kWh/month	194.0250	170.8495	179.2363	160.7209	158.2848	141.3886	134.6902	149.3187	149.5373	166.8791	176.2215	188.8930	(219)
Water heating fuel used	194.0250	170.8495	179.2363	160.7209	158.2848	141.3886	134.6902	149.3187	149.5373	166.8791	176.2215	1970.0449	(219)
Annual totals kWh/year													
Space heating fuel - main system												2159.0619	(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												4018.3233	(238)

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

	Fuel	Fuel price	Fuel cost
	kWh/year	p/kWh	£/year
Space heating - main system 1	2159.0619	3.6300	78.3739 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1970.0449	3.6300	71.5126 (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			223.3503 (255)

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

	Energy	Emission factor	Emissions
	kWh/year	kg CO2/kWh	kg CO2/year
Space heating - main system 1	2159.0619	0.2160	466.3574 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1970.0449	0.2160	425.5297 (264)
Space and water heating			891.8871 (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			834.3904 (272)

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

	Energy	Primary energy factor	Primary energy
	kWh/year	kg CO2/kWh	kWh/year
Space heating - main system 1	2159.0619	1.2200	2634.0556 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1970.0449	1.2200	2403.4548 (264)
Space and water heating			5037.5104 (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			

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PV Unit	-587.1990	3.0700	-1802.7008 (269)
Primary energy kWh/year			4697.4048 (272)
Primary energy kWh/m2/year			67.2981 (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 (22.0%)

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	£206	£206	£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	£224	£198	£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	53 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 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												4.1400
Infiltration rate												0.2070 (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) =	0.1915 (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												
	0.2441	0.2393	0.2346	0.2106	0.2058	0.1819	0.1819	0.1771	0.1915	0.2058	0.2154	0.2250 (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)							5.1605 (36)
Total fabric heat loss						(33) + (36) =	57.6577 (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	86.7957	86.7957	86.7957	86.7957	86.7957	86.7957	86.7957	86.7957	86.7957	86.7957	86.7957	86.7957 (39)
Average = Sum(39)m / 12 =												86.7957 (39)
HLP	1.2435	1.2435	1.2435	1.2435	1.2435	1.2435	1.2435	1.2435	1.2435	1.2435	1.2435	1.2435 (40)
HLP (average)												1.2435 (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												

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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												-821.7834 (H17)
Solar input	-23.8301	-39.7656	-67.7253	-90.7652	-112.1328	-110.2444	-108.7875	-95.0482	-74.4418	-50.8350	-28.2659	-19.9417 (63)
								Solar input (sum of months) =	Sum (63)m =			-821.7834 (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	41.6304	41.6304	41.6304	41.6304	41.6304	41.6304	41.6304	41.6304	41.6304	41.6304	41.6304	41.6304
alpha	3.7754	3.7754	3.7754	3.7754	3.7754	3.7754	3.7754	3.7754	3.7754	3.7754	3.7754	3.7754
util living area	0.9790	0.9654	0.9332	0.8587	0.7314	0.5675	0.4262	0.4740	0.7031	0.9012	0.9662	0.9824 (86)
MIT	19.5746	19.7738	20.1072	20.4967	20.7903	20.9396	20.9841	20.9762	20.8648	20.4636	19.9351	19.5162 (87)
Th 2	19.8854	19.8854	19.8854	19.8854	19.8854	19.8854	19.8854	19.8854	19.8854	19.8854	19.8854	19.8854 (88)
util rest of house	0.9739	0.9573	0.9174	0.8261	0.6739	0.4826	0.3233	0.3669	0.6218	0.8704	0.9568	0.9781 (89)
MIT 2	18.6145	18.8096	19.1321	19.4951	19.7470	19.8564	19.8807	19.8778	19.8111	19.4760	18.9710	18.5571 (90)
Living area fraction									fLA = Living area / (4) =			0.1913 (91)
MIT	18.7981	18.9940	19.3186	19.6867	19.9465	20.0636	20.0917	20.0879	20.0126	19.6649	19.1554	18.7406 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7981	18.9940	19.3186	19.6867	19.9465	20.0636	20.0917	20.0879	20.0126	19.6649	19.1554	18.7406 (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	0.9491	0.9077	0.8195	0.6773	0.4968	0.3428	0.3871	0.6319	0.8632	0.9488	0.9723	(94)
Useful gains	578.3567	642.8560	697.6694	711.1174	629.7288	454.1966	299.4059	314.2480	464.5695	553.0854	550.6852	552.8072	(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	1258.3749	1223.3018	1112.6028	936.2354	715.7630	474.2140	303.0687	320.0905	513.1903	786.7965	1046.3534	1262.0594	(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	505.9336	390.0596	308.7105	162.0850	64.0094	0.0000	0.0000	0.0000	0.0000	173.8810	356.8811	527.6837	(98)
Space heating												2489.2439	(98)
Space heating per m2												35.6625	(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													2744.4806 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	505.9336	390.0596	308.7105	162.0850	64.0094	0.0000	0.0000	0.0000	0.0000	173.8810	356.8811	527.6837	(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)	557.8099	430.0547	340.3644	178.7045	70.5727	0.0000	0.0000	0.0000	0.0000	191.7101	393.4742	581.7902	(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	89.8264	89.8409	89.8218	89.7782	89.5797	87.0000	87.0000	87.0000	87.0000	89.3409	89.6867	87.0000	(216)
(217)m	89.8264	89.8409	89.8218	89.7782	89.5797	87.0000	87.0000	87.0000	87.0000	89.3409	89.6867	89.8569	(217)
Fuel for water heating, kWh/month	166.9913	125.9413	102.6044	57.4626	29.7644	14.6709	9.6471	40.0680	63.9720	108.3860	143.9466	166.2446	(219)
Water heating fuel used												1029.6993	(219)
Annual totals kWh/year													
Space heating fuel - main system												2744.4806	(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												3781.9530	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2744.4806	3.4800	95.5079	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1029.6993	3.4800	35.8335	(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			252.3667	(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] =	0.9233 (257)
SAP value		87.1201
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	2744.4806	0.2160	592.8078	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1029.6993	0.2160	222.4150	(264)
Space and water heating			815.2228	(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			819.2571	(272)
CO2 emissions per m2			11.7400	(273)
EI value			90.4372	
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	=	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												4.1400
Infiltration rate												0.2070 (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) =	0.1915 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000 (22)
Wind factor	1.1750	1.1000	1.1000	1.0000	1.0250	0.9750	0.9750	0.9500	0.9500	1.0250	1.0000	1.0250 (22a)
Adj infilt rate												
	0.2250	0.2106	0.2106	0.1915	0.1963	0.1867	0.1867	0.1819	0.1819	0.1963	0.1915	0.1963 (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)							5.1605 (36)
Total fabric heat loss						(33) + (36) =	57.6577 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 29.1380	Feb 29.1380	Mar 29.1380	Apr 29.1380	May 29.1380	Jun 29.1380	Jul 29.1380	Aug 29.1380	Sep 29.1380	Oct 29.1380	Nov 29.1380	Dec 29.1380 (38)
Heat transfer coeff	86.7957	86.7957	86.7957	86.7957	86.7957	86.7957	86.7957	86.7957	86.7957	86.7957	86.7957	86.7957 (39)
Average = Sum(39)m / 12 =												86.7957 (39)
HLP	Jan 1.2435	Feb 1.2435	Mar 1.2435	Apr 1.2435	May 1.2435	Jun 1.2435	Jul 1.2435	Aug 1.2435	Sep 1.2435	Oct 1.2435	Nov 1.2435	Dec 1.2435 (40)
HLP (average)												1.2435 (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 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	41.6304	41.6304	41.6304	41.6304	41.6304	41.6304	41.6304	41.6304	41.6304	41.6304	41.6304	41.6304
alpha	3.7754	3.7754	3.7754	3.7754	3.7754	3.7754	3.7754	3.7754	3.7754	3.7754	3.7754	3.7754
util living area	0.9694	0.9545	0.9091	0.8054	0.6486	0.4357	0.3079	0.3144	0.5755	0.8397	0.9454	0.9743 (86)
MIT	19.7905	19.9434	20.2791	20.6494	20.8829	20.9801	20.9960	20.9959	20.9446	20.6625	20.1770	19.7480 (87)
Th 2	19.8854	19.8854	19.8854	19.8854	19.8854	19.8854	19.8854	19.8854	19.8854	19.8854	19.8854	19.8854 (88)
util rest of house	0.9617	0.9434	0.8874	0.7621	0.5779	0.3456	0.2052	0.2063	0.4769	0.7903	0.9294	0.9676 (89)
MIT 2	18.8275	18.9756	19.2954	19.6294	19.8173	19.8783	19.8847	19.8847	19.8617	19.6523	19.2058	18.7865 (90)
Living area fraction									fLA = Living area / (4) =			0.1913 (91)
MIT	19.0117	19.1607	19.4836	19.8245	20.0211	20.0890	20.0973	20.0973	20.0688	19.8456	19.3915	18.9704 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0117	19.1607	19.4836	19.8245	20.0211	20.0890	20.0973	20.0973	20.0688	19.8456	19.3915	18.9704 (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	0.8782	0.7595	0.5871	0.3625	0.2250	0.2271	0.4941	0.7882	0.9205	0.9605	(94)
Useful gains	593.7070	647.3369	701.2778	691.7393	556.3537	358.2753	207.4902	198.8147	388.4404	533.0818	562.0461	560.8097	(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	1164.0791	1142.2901	1031.4446	844.0427	600.7232	363.5890	208.0738	199.3927	405.2348	672.2813	936.6581	1151.8114	(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	424.3569	332.6086	245.6441	109.6584	33.0109	0.0000	0.0000	0.0000	0.0000	103.5644	269.7207	439.7053	(98)
Space heating												1958.2692	(98)
Space heating per m2											(98) / (4) =	28.0554	(99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													90.7000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													2159.0619	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	424.3569	332.6086	245.6441	109.6584	33.0109	0.0000	0.0000	0.0000	0.0000	103.5644	269.7207	439.7053	(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)	467.8686	366.7129	270.8314	120.9024	36.3957	0.0000	0.0000	0.0000	0.0000	114.1834	297.3767	484.7908	(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	89.7229	89.7296	89.6663	89.5052	88.8500	87.0000	87.0000	87.0000	87.0000	88.9094	89.4978	87.0000	(216)	
(217)m	89.7229	89.7296	89.6663	89.5052	88.8500	87.0000	87.0000	87.0000	87.0000	88.9094	89.4978	89.7421	(217)	
Fuel for water heating, kWh/month	162.7899	126.3984	101.8795	56.0448	35.6370	7.4475	7.6936	33.5102	58.8942	104.7844	139.1301	164.1741	(219)	
Water heating fuel used												998.3836	(219)	
Annual totals kWh/year														
Space heating fuel - main system												2159.0619	(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												3096.6619	(238)	

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2159.0619	3.6300	78.3739	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	998.3836	3.6300	36.2413	(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			197.7989	(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	2159.0619	0.2160	466.3574	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	998.3836	0.2160	215.6509	(264)
Space and water heating			682.0082	(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			650.4616 (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	2159.0619	1.2200	2634.0556 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	998.3836	1.2200	1218.0280 (264)
Space and water heating			3852.0835 (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			3665.4779 (272)
Primary energy kWh/m2/year			52.5140 (273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0647 Plot 73	Issued on Date	01/03/2022
Assessment Reference	As Built	Prop Type Ref	T (HA/SO/AR)
Project	7 Shaw Road, West End, Southampton, SO30 3JZ		
Calculation Type	New Build (As Built)		

SAP Rating	86 B	DER	16.13	TER	20.50
Environmental	88 B	% DER<TER	21.33		
CO ₂ Emissions (t/year)	0.83	DFEE	50.45	TREE	61.02
General Requirements Compliance	Pass	% DFEE<TFEE	17.32		

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 73	Issued on Date	01/03/2022
Assessment Reference	As Built	Prop Type Ref	T (HA/SO/AR)
Project	7 Shaw Road, West End, Southampton, SO30 3JZ		
Calculation Type	New Build (As Built)		

SAP Rating	86 B	DER	16.13	TER	20.50
Environmental	88 B	% DER<TER	21.33		
CO ₂ Emissions (t/year)	0.83	DFEE	50.45	TFEE	61.02
General Requirements Compliance	Pass	% DFEE<TFEE	17.32		

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 73	Issued on Date	01/03/2022
Assessment Reference	As Built	Prop Type Ref	T (HA/SO/AR)
Project	7 Shaw Road, West End, Southampton, SO30 3JZ		
Calculation Type	New Build (As Built)		

SAP Rating	86 B	DER	16.13	TER	20.50
Environmental	88 B	% DER<TER	21.33		
CO ₂ Emissions (t/year)	0.83	DFEE	50.45	TFEE	61.02
General Requirements Compliance	Pass	% DFEE<TFEE	17.32		

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

Floor 000003 - Worst Case Slab

Floor Type: Slab On Ground Floor

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

Horizontal edge insulation: none

Vertical edge insulation: none

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)	Density (kg/m ³)	Heat Cap. (J/kgK)
Ext surface				0.0400			
Layer 1	Concrete, medium density						
	Main construction	100	1.3500	0.0741	100.00		
Layer 2	Polythene, 1000 gauge						
	Main construction	0.5	0.0000	0.0000	100.00		
Layer 3	Celotex XR4000						
	Main construction	150	0.0220	6.8182	100.00		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 4	Polythene, 500 gauge						
	Main construction	0.5	0.0000	0.0000	100.00		
Layer 5	Screed						
	Main construction	70	1.1500	0.0609	100.00	1200	1000
Int surface				0.1700			

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

Total correction = 0.0096 m² K/W

U-value (unrounded) = 0.12 W/m² K

Unheated space: None

Total thickness: 321 mm

U-value: 0.12 W/m² K

Kappa: 84.00 kJ/m² K

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Property Reference	SAP 0647 Plot 73	Issued on Date	01/03/2022
Assessment Reference	As Built	Prop Type Ref	T (HA/SO/AR)
Property	7 Shaw Road, West End, Southampton, SO30 3JZ		
SAP Rating	86 B	DER	16.13
Environmental	88 B	TER	20.50
CO ₂ Emissions (t/year)	0.83	% DER<TER	21.33
General Requirements Compliance	Pass	DfEE	50.45
		TFEE	61.02
		% DfEE<TFEE	17.32
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
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8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	186.36	kJ/m²K

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

None

15.0 Draught Proofing

100 %

16.0 Draught Lobby

No

17.0 Thermal Bridging

Calculate Bridges

17.1 List of Bridges

Source Type	Bridge Type	Length	Psi	Imported	Reference:
Independently assessed	E2 Other lintels (including other steel lintels)	1.92	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	0.060	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)	8.75	0.054	No	CD0031
Independently assessed	E16 Corner (normal)	20.20	0.050	No	CD0035

Y-value 0.027 W/m²K

18.0 Pressure Testing

Yes

Designed AP₅₀ 5.00 m³/(h.m²) @ 50 Pa

Property Tested ? Yes

As Built AP₅₀ 4.14 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	