



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 8, Shaw Crescent
West End, Southampton, SO30 3LH

Contact: Tobias Whiting
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Report Issue Date: 07/08/2024

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0943 Plot 18			Issued on Date	07/08/2024
Assessment Reference	As Built	Prop Type Ref	Type D		
Property	8, Shaw Crescent, West End, Southampton, SO30 3LH				
SAP Rating	89 B	DER	12.17	TER	17.89
Environmental	91 B	% DER<TER	31.97		
CO ₂ Emissions (t/year)	0.69	DFEE	43.71	TFEE	50.48
General Requirements Compliance	Pass	% DFEE<TFEE	13.41		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com			Assessor ID	E477-0001
Client	Foreman Homes, FORE				

SUMMARY FOR INPUT DATA FOR New Build (As 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)	17.89	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	12.17	kgCO ₂ /m ²	Pass
	-5.72 (-32.0%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	50.48	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	43.71	kWh/m ² /yr	
	-6.8 (-13.5%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	Pass
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	Pass
Openings	1.19 (max. 2.00)	1.20 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.54 (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

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Main heating system

Boiler system with radiators or underfloor - Mains gas
Data from database
Vaillant ecoFIT sustain 835 VUW 356/6-3 (H-GB)
Combi boiler
Efficiency: 89.3% 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

0.17

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

8.50 m², No overhang

Windows facing West

3.76 m², No overhang

Air change rate

4.00 ach

Blinds/curtains

None

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

3.54 (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
Air permeability	3.5	m ³ /m ² h
Photovoltaic array	1.09	kW

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THERMAL BRIDGING

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Environmental	91 B	% DER<TER	31.97		
CO ₂ Emissions (t/year)	0.69	DFEE	43.71	TFEE	50.48
General Requirements Compliance	Pass	% DFEE<TFEE	13.41		
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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	0.071	1.93	0.14	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.064	4.99	0.32	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.067	1.59	0.11	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.061	1.81	0.11	Birtley Supatherm
External wall	E3 Sill	Independently assessed	0.021	7.71	0.16	Knauf P5
External wall	E4 Jamb	Independently assessed	0.016	22.20	0.36	Knauf P6
External wall	E5 Ground floor (normal)	Table K1 - Default	0.320	18.47	5.91	
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.000	18.47	0.00	CD0029
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	9.74	0.58	
External wall	E12 Gable (insulation at ceiling level)	Independently assessed	0.044	8.83	0.39	Knauf P21
External wall	E16 Corner (normal)	Independently assessed	0.039	9.90	0.39	Knauf P23
External wall	E25 Staggered party wall between dwellings	Independently assessed	0.055	9.90	0.54	Knauf P27 Halved
Party wall	P1 Party wall - Ground floor	Table K1 - Default	0.160	8.81	1.41	
Party wall	P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	0.000	8.81	0.00	
Party wall	P4 Party wall - Roof (insulation at ceiling level)	Independently assessed	0.035	8.81	0.31	Knauf P29 Halved

Total: **10.72** W/mK:
Y-Value: **0.061** W/m²K:

FULL SAP CALCULATION PRINTOUT

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

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DWELLING AS BUILT

Semi-Detached House, total floor area 85 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) 17.89 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 12.17 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)50.5 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)43.7 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:	3.54 (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

Vaillant ecoFIT sustain 835 VUW 356/6-3 (H-GB)

Combi boiler

Efficiency: 89.3% 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:	0.17	
Maximum	0.7	OK

9 Summertime temperature

Overheating risk (Southern England): Slight OK

Based on:

Overshading:	Average
Windows facing East:	8.50 m ² , No overhang
Windows facing West:	3.76 m ² , No overhang
Air change rate:	4.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Roof U-value	0.10 W/m ² K
Floor U-value	0.12 W/m ² K
Door U-value	1.10 W/m ² K
Air permeability	3.5 m ³ /m ² h
Photovoltaic array	1.09 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	42.7100 (1b)	x 2.3900 (2b)	= 102.0769 (1b) - (3b)
First floor	42.7100 (1c)	x 2.5600 (2c)	= 109.3376 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.4145 (5)

2. Ventilation rate

										main	secondary	other	total	m3 per hour			
										heating	heating						
Number of chimneys										0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues										0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans																0 * 10 =	0.0000 (7a)
Number of passive vents																0 * 10 =	0.0000 (7b)
Number of flueless gas fires																0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans										= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) =		0.0000 (8)	
Pressure test														Yes			
Measured/design AP50														3.5400			
Infiltration rate														0.1770 (18)			
Number of sides sheltered														2 (19)			
Shelter factor										(20) = 1 - [0.075 x (19)] =				0.8500 (20)			
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =				0.1505 (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																	
	0.1918	0.1881	0.1843	0.1655	0.1617	0.1429	0.1429	0.1392	0.1505	0.1617	0.1693	0.1768 (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 m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Front Door			2.1500	1.1000	2.3650		(26)					
Windows (Uw = 1.20)			12.2600	1.1450	14.0382		(27)					
Ground Floor			42.7100	0.1200	5.1252	84.0000	3587.6400 (28a)					
Brick and Block	91.4300	14.4100	77.0200	0.2400	18.4848	42.2200	3251.7844 (29a)					
Pitched Roof	42.7100		42.7100	0.1000	4.2710	9.1000	388.6610 (30)					
Total net area of external elements Aum(A, m2)			176.8500				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =	44.2842			(33)					
Party Wall 1			43.6100	0.0000	0.0000	110.0000	4797.1000 (32)					
Ground Floor Block			23.0400			75.0000	1728.0000 (32c)					
Ground Floor Stud			45.0800			9.0000	405.7200 (32c)					
First Floor Stud			93.6900			9.0000	843.2100 (32c)					
Internal Floor 1			42.7100			18.0000	768.7800 (32d)					
Internal Ceiling 1			42.7100			18.0000	768.7800 (32e)					
Heat capacity Cm = Sum(A x k)				(28) ... (30) + (32) + (32a) ... (32e) =	16539.6754		(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							193.6277 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.7223 (36)					
Total fabric heat loss				(33) + (36) =	55.0065		(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 34.8834	Feb 34.8834	Mar 34.8834	Apr 34.8834	May 34.8834	Jun 34.8834	Jul 34.8834	Aug 34.8834	Sep 34.8834	Oct 34.8834	Nov 34.8834	Dec 34.8834 (38)
Heat transfer coeff	89.8899	89.8899	89.8899	89.8899	89.8899	89.8899	89.8899	89.8899	89.8899	89.8899	89.8899	89.8899 (39)
Average = Sum(39)m / 12 =												89.8899 (39)
HLP	Jan 1.0523	Feb 1.0523	Mar 1.0523	Apr 1.0523	May 1.0523	Jun 1.0523	Jul 1.0523	Aug 1.0523	Sep 1.0523	Oct 1.0523	Nov 1.0523	Dec 1.0523 (40)
HLP (average)												1.0523 (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												2.5577 (42)
Average daily hot water use (litres/day)												94.9455 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Daily hot water use	104.4400	100.6422	96.8444	93.0466	89.2488	85.4509	85.4509	89.2488	93.0466	96.8444	100.6422	104.4400 (44)
Energy conte	154.8815	135.4604	139.7830	121.8662	116.9335	100.9047	93.5031	107.2961	108.5776	126.5367	138.1247	149.9945 (45)
Energy content (annual)										Total = Sum (45)m =		1493.8621 (45)
Distribution loss (46)m = 0.15 x (45)m	23.2322	20.3191	20.9674	18.2799	17.5400	15.1357	14.0255	16.0944	16.2866	18.9805	20.7187	22.4992 (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	0.6707	0.6072	0.6092	0.5103	0.4696	0.3880	0.3595	0.4309	0.4546	0.5514	0.6191	0.6495 (61)
Total heat required for water heating calculated for each month	155.5522	136.0676	140.3922	122.3765	117.4031	101.2927	93.8626	107.7271	109.0322	127.0882	138.7438	150.6440 (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	155.5522	136.0676	140.3922	122.3765	117.4031	101.2927	93.8626	107.7271	109.0322	127.0882	138.7438	150.6440 (64)
Heat gains from water heating, kWh/month	51.6658	45.1924	46.6301	40.6481	38.9978	33.6478	31.1797	35.7837	36.2157	42.2113	46.0812	50.0356 (65)
Solar input (sum of months) = Sum (63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum (64)m = 1500.1822 (64)												

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	127.8852	127.8852	127.8852	127.8852	127.8852	127.8852	127.8852	127.8852	127.8852	127.8852	127.8852	127.8852 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.9172	19.4667	15.8314	11.9854	8.9592	7.5637	8.1729	10.6234	14.2587	18.1047	21.1309	22.5264 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	230.3951	232.7859	226.7612	213.9354	197.7450	182.5284	172.3628	169.9720	175.9967	188.8225	205.0129	220.2295 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7885	35.7885	35.7885	35.7885	35.7885	35.7885	35.7885	35.7885	35.7885	35.7885	35.7885	35.7885 (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)	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082 (71)
Water heating gains (Table 5)	69.4433	67.2506	62.6749	56.4557	52.4164	46.7331	41.9081	48.0964	50.2996	56.7356	64.0017	67.2521 (72)
Total internal gains	386.1212	383.8687	369.6331	346.7420	323.4862	301.1908	286.8094	293.0573	304.9206	328.0285	354.5111	374.3735 (73)

6. Solar gains

[Jan]			Area m2	Solar flux Table 6a		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
East			8.5000	19.6403		0.6300		0.7000		0.7700		51.0197 (76)
West			3.7600	19.6403		0.6300		0.7000		0.7700		22.5687 (80)
Solar gains	73.5884	143.9546	237.0727	345.7564	423.7375	433.7707	412.9674	354.7329	275.7254	170.8143	91.7561	60.5156 (83)
Total gains	459.7096	527.8233	606.7058	692.4984	747.2237	734.9615	699.7768	647.7902	580.6460	498.8427	446.2672	434.8891 (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	51.1109	51.1109	51.1109	51.1109	51.1109	51.1109	51.1109	51.1109	51.1109	51.1109	51.1109	51.1109
alpha	4.4074	4.4074	4.4074	4.4074	4.4074	4.4074	4.4074	4.4074	4.4074	4.4074	4.4074	4.4074
util living area	0.9962	0.9925	0.9813	0.9456	0.8577	0.7040	0.5444	0.6033	0.8409	0.9697	0.9931	0.9970 (86)
MIT	19.5734	19.7372	20.0317	20.4081	20.7332	20.9209	20.9801	20.9690	20.8195	20.3831	19.8974	19.5277 (87)
Th 2	20.0400	20.0400	20.0400	20.0400	20.0400	20.0400	20.0400	20.0400	20.0400	20.0400	20.0400	20.0400 (88)
util rest of house	0.9952	0.9905	0.9761	0.9297	0.8164	0.6238	0.4351	0.4925	0.7794	0.9580	0.9909	0.9963 (89)
MIT 2	18.7307	18.8938	19.1854	19.5510	19.8490	19.9982	20.0334	20.0288	19.9286	19.5330	19.0540	18.6853 (90)
Living area fraction	18.9164	19.0796	19.3719	19.7398	20.0438	20.2015	20.2420	20.2359	20.1249	19.7203	19.2398	0.2203 (91)
MIT	18.9164	19.0796	19.3719	19.7398	20.0438	20.2015	20.2420	20.2359	20.1249	19.7203	19.2398	18.8709 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9164	19.0796	19.3719	19.7398	20.0438	20.2015	20.2420	20.2359	20.1249	19.7203	19.2398	18.8709 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	456.7795	521.4189	589.4083	639.6959	610.1745	469.1258	321.1515	334.4545	456.1632	475.3767	441.1010	432.6899 (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	1313.8638	1274.6042	1157.0490	974.3911	750.0232	503.5168	327.3781	344.8100	541.5782	819.8236	1091.2452	1318.7633 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	637.6707	506.1405	422.3247	240.9805	104.0474	0.0000	0.0000	0.0000	0.0000	256.2685	468.1038	659.2385 (98)
Space heating												3294.7748 (98)
Space heating per m2												38.5715 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)											
Fraction of space heat from main system(s)	1.0000 (202)											
Efficiency of main space heating system 1 (in %)	90.2000 (206)											
Efficiency of secondary/supplementary heating system, %	0.0000 (208)											
Space heating requirement	3652.7437 (211)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	637.6707	506.1405	422.3247	240.9805	104.0474	0.0000	0.0000	0.0000	0.0000	256.2685	468.1038	659.2385 (98)
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000 (210)
Space heating fuel (main heating system)	706.9520	561.1314	468.2092	267.1624	115.3519	0.0000	0.0000	0.0000	0.0000	284.1114	518.9621	730.8631 (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	155.5522	136.0676	140.3922	122.3765	117.4031	101.2927	93.8626	107.7271	109.0322	127.0882	138.7438	150.6440 (64)
Efficiency of water heater (217)m	87.1143	86.8752	86.3104	85.0274	82.3172	76.4000	76.4000	76.4000	76.4000	85.1039	86.6227	76.4000 (216)
Fuel for water heating, kWh/month	178.5611	156.6241	162.6596	143.9259	142.6228	132.5821	122.8568	141.0040	142.7123	149.3329	160.1702	172.6224 (219)
Water heating fuel used												1805.6744 (219)
Annual totals kWh/year												
Space heating fuel - main system												3652.7437 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.2380)												
mechanical ventilation fans (SFP = 0.2380)												61.3863 (230a)
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												136.3863 (231)
Electricity for lighting (calculated in Appendix L)												387.0649 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV Unit 0 (0.80 + 1.09 + 908 + 1.00) =									-791.6489			-791.6489 (233)
Total delivered energy for all uses												5190.2203 (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	3652.7437	0.2160	788.9926 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1805.6744	0.2160	390.0257 (264)
Space and water heating			1179.0183 (265)
Pumps and fans	136.3863	0.5190	70.7845 (267)
Energy for lighting	387.0649	0.5190	200.8867 (268)
Energy saving/generation technologies			
PV Unit	-791.6489	0.5190	-410.8658 (269)
Total CO2, kg/year			1039.8237 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			12.1700 (273)

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

DER		12.1700 ZC1
Total Floor Area	TFA	85.4200
Assumed number of occupants	N	2.5577
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		15.9831 ZC2
CO2 emissions from cooking, equation (L16)		2.1117 ZC3
Total CO2 emissions		30.2648 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		30.2648 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.7100 (1b)	x 2.3900 (2b)	= 102.0769 (1b) - (3b)
First floor	42.7100 (1c)	x 2.5600 (2c)	= 109.3376 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.4145 (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					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					30.0000 / (5) = 0.1419 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3919 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3331 (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	0.4247	0.4164	0.4081	0.3664	0.3581	0.3165	0.3165	0.3081	0.3331	0.3581	0.3748	0.3914 (22b)
Effective ac	0.5902	0.5867	0.5833	0.5671	0.5641	0.5501	0.5501	0.5475	0.5555	0.5641	0.5702	0.5766 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1500	1.0000	2.1500		(26)
TER Opening Type (Uw = 1.40)			12.2600	1.3258	16.2538		(27)
Ground Floor			42.7100	0.1300	5.5523		(28a)
Brick and Block	91.4300	14.4100	77.0200	0.1800	13.8636		(29a)
Pitched Roof	42.7100		42.7100	0.1300	5.5523		(30)
Total net area of external elements Aum(A, m ²)			176.8500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	43.3720		(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)							9.3279 (36)
Total fabric heat loss						(33) + (36) =	52.6999 (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	41.1760	40.9316	40.6921	39.5672	39.3567	38.3769	38.3769	38.1954	38.7543	39.3567	39.7825	40.2276 (38)
Heat transfer coeff	93.8759	93.6315	93.3920	92.2670	92.0566	91.0768	91.0768	90.8953	91.4542	92.0566	92.4824	92.9275 (39)
Average = Sum(39)m / 12 =												92.2660 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0990	1.0961	1.0933	1.0802	1.0777	1.0662	1.0662	1.0641	1.0706	1.0777	1.0827	1.0879 (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												2.5577 (42)
Average daily hot water use (litres/day)												94.9455 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	104.4400	100.6422	96.8444	93.0466	89.2488	85.4509	85.4509	89.2488	93.0466	96.8444	100.6422	104.4400 (44)
Energy conte	154.8815	135.4604	139.7830	121.8662	116.9335	100.9047	93.5031	107.2961	108.5776	126.5367	138.1247	149.9945 (45)
Energy content (annual)										Total = Sum(45)m =		1493.8621 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:	23.2322	20.3191	20.9674	18.2799	17.5400	15.1357	14.0255	16.0944	16.2866	18.9805	20.7187	22.4992 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Total heat required for water heating calculated for each month	50.9589	46.0274	49.3508	45.8860	45.4802	42.1402	43.5449	45.4802	45.8860	49.3508	49.3151	50.9589 (61)
Solar input	205.8404	181.4878	189.1338	167.7522	162.4137	143.0449	137.0479	152.7763	154.4636	175.8876	187.4398	200.9534 (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	205.8404	181.4878	189.1338	167.7522	162.4137	143.0449	137.0479	152.7763	154.4636	175.8876	187.4398	200.9534 (64)
	64.2378	56.5474	58.8156	51.9920	50.2504	44.0859	41.9760	47.0460	47.5735	54.4112	58.2552	62.6129 (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	127.8852	127.8852	127.8852	127.8852	127.8852	127.8852	127.8852	127.8852	127.8852	127.8852	127.8852	127.8852	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.9172	19.4667	15.8314	11.9854	8.9592	7.5637	8.1729	10.6234	14.2587	18.1047	21.1309	22.5264	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	230.3951	232.7859	226.7612	213.9354	197.7450	182.5284	172.3628	169.9720	175.9967	188.8225	205.0129	220.2295	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7885	35.7885	35.7885	35.7885	35.7885	35.7885	35.7885	35.7885	35.7885	35.7885	35.7885	35.7885	(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)	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	(71)
Water heating gains (Table 5)	86.3412	84.1480	79.0532	72.2111	67.5409	61.2304	56.4193	63.2339	66.0744	73.1333	80.9101	84.1571	(72)
Total internal gains	403.0191	400.7661	386.0113	362.4974	338.6107	315.6881	301.3205	308.1949	320.6953	344.4261	371.4194	391.2785	(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					8.5000	19.6403	0.6300	0.7000			0.7700	51.0197
West					3.7600	19.6403	0.6300	0.7000			0.7700	22.5687 (80)

Solar gains	73.5884	143.9546	237.0727	345.7564	423.7375	433.7707	412.9674	354.7329	275.7254	170.8143	91.7561	60.5156 (83)
Total gains	476.6075	544.7207	623.0841	708.2539	762.3482	749.4588	714.2880	662.9278	596.4207	515.2404	463.1755	451.7941 (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	63.1892	63.3541	63.5166	64.2910	64.4380	65.1313	65.1313	65.2613	64.8625	64.4380	64.1414	63.8341	
alpha	5.2126	5.2236	5.2344	5.2861	5.2959	5.3421	5.3421	5.3508	5.3242	5.2959	5.2761	5.2556	
util living area	0.9986	0.9969	0.9906	0.9650	0.8857	0.7211	0.5495	0.6098	0.8646	0.9823	0.9971	0.9989	(86)
MIT	19.7884	19.9291	20.1813	20.5179	20.7984	20.9526	20.9908	20.9845	20.8713	20.4972	20.0831	19.7658	(87)
Th 2	20.0017	20.0040	20.0063	20.0171	20.0191	20.0285	20.0285	20.0303	20.0249	20.0191	20.0150	20.0107	(88)
util rest of house	0.9981	0.9958	0.9872	0.9516	0.8431	0.6335	0.4342	0.4917	0.7989	0.9732	0.9959	0.9986	(89)
MIT 2	18.3790	18.5862	18.9548	19.4433	19.8182	19.9964	20.0250	20.0237	19.9180	19.4224	18.8197	18.3525	(90)
Living area fraction	18.6895	18.8821	19.2250	19.6800	20.0342	20.2071	20.2378	20.2354	20.1281	19.6592	19.0981	18.6639	(92)
Temperature adjustment	18.6895	18.8821	19.2250	19.6800	20.0342	20.2071	20.2378	20.2354	20.1281	19.6592	19.0981	18.6639	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	475.2540	541.4464	612.8072	669.8327	643.2919	487.6973	328.3653	343.2218	481.2995	499.0899	460.4776	450.8191	(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	1350.8286	1309.1646	1188.4132	994.6433	767.2143	510.6742	331.3207	348.6189	551.2924	833.9611	1109.6119	1344.0935	(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	651.4275	515.9066	428.2509	233.8636	92.1983	0.0000	0.0000	0.0000	0.0000	249.1442	467.3767	664.5962	(98)
Space heating												3302.7640	(98)
Space heating per m2												38.6650	(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													3536.1499 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	651.4275	515.9066	428.2509	233.8636	92.1983	0.0000	0.0000	0.0000	0.0000	249.1442	467.3767	664.5962	(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)	697.4598	552.3626	458.5127	250.3893	98.7133	0.0000	0.0000	0.0000	0.0000	266.7497	500.4033	711.5591	(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	205.8404	181.4878	189.1338	167.7522	162.4137	143.0449	137.0479	152.7763	154.4636	175.8876	187.4398	200.9534	(64)
Efficiency of water heater	87.7499	87.5348	87.0460	85.8877	83.6857	80.3000	80.3000	80.3000	80.3000	85.9275	87.2584	87.8351	(216)
Fuel for water heating, kWh/month	234.5763	207.3322	217.2804	195.3156	194.0758	178.1381	170.6699	190.2569	192.3581	204.6930	214.8101	228.7850	(219)
Water heating fuel used												2428.2915	(219)
Annual totals kWh/year													
Space heating fuel - main system												3536.1499	(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)												387.0649	(232)
Total delivered energy for all uses												6426.5062	(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	3536.1499	0.2160	763.8084 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2428.2915	0.2160	524.5110 (264)
Space and water heating			1288.3193 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	387.0649	0.5190	200.8867 (268)
Total CO2, kg/m2/year			1528.1310 (272)
Emissions per m2 for space and water heating			15.0822 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3518 (272b)
Emissions per m2 for pumps and fans			0.4557 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.0822 * 1.00) + 2.3518 + 0.4557, rounded to 2 d.p.			17.8900 (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	42.7100 (1b)	x 2.3900 (2b)	= 102.0769 (1b) - (3b)
First floor	42.7100 (1c)	x 2.5600 (2c)	= 109.3376 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.4145 (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					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					30.0000 / (5) = 0.1419 (8)
Pressure test					Yes
Measured/design AP50					3.5400
Infiltration rate					0.3189 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)]	=	0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20)	=	0.2711 (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	0.3456	0.3388	0.3321	0.2982	0.2914	0.2575	0.2575	0.2507	0.2711	0.2914	0.3049	0.3185 (22b)
Effective ac	0.5597	0.5574	0.5551	0.5445	0.5425	0.5332	0.5332	0.5314	0.5367	0.5425	0.5465	0.5507 (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			2.1500	1.1000	2.3650		(26)
Windows (Uw = 1.20)			12.2600	1.1450	14.0382		(27)
Ground Floor			42.7100	0.1200	5.1252	84.0000	3587.6400 (28a)
Brick and Block	91.4300	14.4100	77.0200	0.2400	18.4848	42.2200	3251.7844 (29a)
Pitched Roof	42.7100		42.7100	0.1000	4.2710	9.1000	388.6610 (30)
Total net area of external elements Aum(A, m ²)			176.8500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.2842		(33)
Party Wall 1			43.6100	0.0000	0.0000	110.0000	4797.1000 (32)
Ground Floor Block			23.0400			75.0000	1728.0000 (32c)
Ground Floor Stud			45.0800			9.0000	405.7200 (32c)
First Floor Stud			93.6900			9.0000	843.2100 (32c)
Internal Floor 1			42.7100			18.0000	768.7800 (32d)
Internal Ceiling 1			42.7100			9.0000	384.3900 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	16155.2854 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							189.1277 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.7223 (36)
Total fabric heat loss						(33) + (36) =	55.0065 (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	39.0501	38.8883	38.7297	37.9848	37.8454	37.1966	37.1966	37.0765	37.4465	37.8454	38.1273	38.4221 (38)
Heat transfer coeff	94.0565	93.8947	93.7362	92.9912	92.8519	92.2031	92.2031	92.0829	92.4530	92.8519	93.1338	93.4286 (39)
Average = Sum(39)m / 12 =												92.9906 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1011	1.0992	1.0974	1.0886	1.0870	1.0794	1.0794	1.0780	1.0823	1.0870	1.0903	1.0938 (40)
HLP (average)												1.0886 (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												2.5577 (42)
Average daily hot water use (litres/day)												94.9455 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	104.4400	100.6422	96.8444	93.0466	89.2488	85.4509	85.4509	89.2488	93.0466	96.8444	100.6422	104.4400 (44)
Energy conte	154.8815	135.4604	139.7830	121.8662	116.9335	100.9047	93.5031	107.2961	108.5776	126.5367	138.1247	149.9945 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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Energy content (annual)	Total = Sum(45)m = 1493.8621 (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	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	32.9123	28.7853	29.7039	25.8966	24.8484	21.4423	19.8694	22.8004	23.0727	26.8891	29.3515	31.8738 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	127.8852	127.8852	127.8852	127.8852	127.8852	127.8852	127.8852	127.8852	127.8852	127.8852	127.8852	127.8852	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.9172	19.4667	15.8314	11.9854	8.9592	7.5637	8.1729	10.6234	14.2587	18.1047	21.1309	22.5264	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	230.3951	232.7859	226.7612	213.9354	197.7450	182.5284	172.3628	169.9720	175.9967	188.8225	205.0129	220.2295	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7885	35.7885	35.7885	35.7885	35.7885	35.7885	35.7885	35.7885	35.7885	35.7885	35.7885	35.7885	(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)	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	(71)
Water heating gains (Table 5)	44.2370	42.8353	39.9246	35.9675	33.3983	29.7809	26.7062	30.6457	32.0455	36.1412	40.7660	42.8412	(72)
Total internal gains	357.9149	356.4535	343.8827	323.2538	301.4682	281.2386	268.6074	272.6067	283.6664	304.4340	328.2753	346.9626	(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					8.5000	19.6403	0.6300	0.7000			0.7700	51.0197
West					3.7600	19.6403	0.6300	0.7000			0.7700	22.5687 (80)

Solar gains	73.5884	143.9546	237.0727	345.7564	423.7375	433.7707	412.9674	354.7329	275.7254	170.8143	91.7561	60.5156 (83)
Total gains	431.5034	500.4081	580.9555	669.0102	725.2057	715.0094	681.5748	627.3396	559.3918	475.2483	420.0314	407.4781 (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	47.7115	47.7937	47.8746	48.2581	48.3305	48.6706	48.6706	48.7341	48.5390	48.3305	48.1842	48.0322	
alpha	4.1808	4.1862	4.1916	4.2172	4.2220	4.2447	4.2447	4.2489	4.2359	4.2220	4.2123	4.2021	
util living area	0.9967	0.9934	0.9836	0.9515	0.8718	0.7248	0.5667	0.6278	0.8581	0.9739	0.9941	0.9974	(86)
MIT	19.4296	19.6026	19.9145	20.3254	20.6806	20.9005	20.9731	20.9589	20.7817	20.3055	19.7896	19.3960	(87)
Th 2	19.9999	20.0015	20.0030	20.0101	20.0115	20.0177	20.0177	20.0188	20.0153	20.0115	20.0088	20.0059	(88)
util rest of house	0.9959	0.9917	0.9789	0.9371	0.8328	0.6444	0.4528	0.5136	0.7998	0.9636	0.9922	0.9968	(89)
MIT 2	18.5585	18.7320	19.0426	19.4493	19.7797	19.9641	20.0087	20.0036	19.8777	19.4370	18.9247	18.5296	(90)
Living area fraction	18.7505	18.9238	19.2347	19.6423	19.9782	20.1704	20.2211	20.2141	20.0769	19.6284	19.1153	18.7205	(91)
MIT	18.7505	18.9238	19.2347	19.6423	19.9782	20.1704	20.2211	20.2141	20.0769	19.6284	19.1153	18.7205	(92)
Temperature adjustment	18.7505	18.9238	19.2347	19.6423	19.9782	20.1704	20.2211	20.2141	20.0769	19.6284	19.1153	18.7205	(93)
adjusted MIT	18.7505	18.9238	19.2347	19.6423	19.9782	20.1704	20.2211	20.2141	20.0769	19.6284	19.1153	18.7205	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	429.0654	494.9682	566.0264	622.5248	602.8342	470.4776	325.4447	337.4090	449.7640	455.4847	415.7757	405.6551	(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	1359.1612	1316.7628	1193.7027	998.9405	768.6450	513.6067	333.8812	351.2095	552.5792	838.3017	1119.0269	1356.6264	(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	691.9913	552.2460	466.9912	271.0193	123.3632	0.0000	0.0000	0.0000	0.0000	284.8158	506.3409	707.5226	(98)
Space heating													3604.2901 (98)
Space heating per m2													42.1949 (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	866.7090	682.3029	699.8304	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8376	0.8999	0.8714	0.0000	0.0000	0.0000	0.0000	(101)

FULL SAP CALCULATION PRINTOUT

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Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	725.9470	613.9927	609.8394	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	932.1835	891.1435	829.5747	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	148.4902	206.2002	163.4831	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												518.1735 (104)
Cooled fraction									FC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	37.1226	51.5500	40.8708	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												129.5434 (107)
Space cooling per m2												1.5165 (108)
Energy for space heating												42.1949 (99)
Energy for space cooling												1.5165 (108)
Total												43.7115 (109)
Dwelling Fabric Energy Efficiency (DFEE)												43.7 (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	42.7100 (1b)	x 2.3900 (2b)	= 102.0769 (1b) - (3b)
First floor	42.7100 (1c)	x 2.5600 (2c)	= 109.3376 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.4145 (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					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					30.0000 / (5) = 0.1419 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3919 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3331 (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	0.4247	0.4164	0.4081	0.3664	0.3581	0.3165	0.3165	0.3081	0.3331	0.3581	0.3748	0.3914 (22b)
Effective ac	0.5902	0.5867	0.5833	0.5671	0.5641	0.5501	0.5501	0.5475	0.5555	0.5641	0.5702	0.5766 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1500	1.0000	2.1500		(26)
TER Opening Type (Uw = 1.40)			12.2600	1.3258	16.2538		(27)
Ground Floor			42.7100	0.1300	5.5523		(28a)
Brick and Block	91.4300	14.4100	77.0200	0.1800	13.8636		(29a)
Pitched Roof	42.7100		42.7100	0.1300	5.5523		(30)
Total net area of external elements Aum(A, m ²)			176.8500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	43.3720		(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)							9.3279 (36)
Total fabric heat loss						(33) + (36) =	52.6999 (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	41.1760	40.9316	40.6921	39.5672	39.3567	38.3769	38.3769	38.1954	38.7543	39.3567	39.7825	40.2276 (38)
Heat transfer coeff	93.8759	93.6315	93.3920	92.2670	92.0566	91.0768	91.0768	90.8953	91.4542	92.0566	92.4824	92.9275 (39)
Average = Sum(39)m / 12 =												92.2660 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0990	1.0961	1.0933	1.0802	1.0777	1.0662	1.0662	1.0641	1.0706	1.0777	1.0827	1.0879 (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												2.5577 (42)
Average daily hot water use (litres/day)												94.9455 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	104.4400	100.6422	96.8444	93.0466	89.2488	85.4509	85.4509	89.2488	93.0466	96.8444	100.6422	104.4400 (44)
Energy conte	154.8815	135.4604	139.7830	121.8662	116.9335	100.9047	93.5031	107.2961	108.5776	126.5367	138.1247	149.9945 (45)
Energy content (annual)										Total = Sum(45)m =		1493.8621 (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												

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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)
	32.9123	28.7853	29.7039	25.8966	24.8484	21.4423	19.8694	22.8004	23.0727	26.8891	29.3515	31.8738 (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	127.8852	127.8852	127.8852	127.8852	127.8852	127.8852	127.8852	127.8852	127.8852	127.8852	127.8852	127.8852	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.9172	19.4667	15.8314	11.9854	8.9592	7.5637	8.1729	10.6234	14.2587	18.1047	21.1309	22.5264	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	230.3951	232.7859	226.7612	213.9354	197.7450	182.5284	172.3628	169.9720	175.9967	188.8225	205.0129	220.2295	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7885	35.7885	35.7885	35.7885	35.7885	35.7885	35.7885	35.7885	35.7885	35.7885	35.7885	35.7885	(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)	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	(71)
Water heating gains (Table 5)	44.2370	42.8353	39.9246	35.9675	33.3983	29.7809	26.7062	30.6457	32.0455	36.1412	40.7660	42.8412	(72)
Total internal gains	357.9149	356.4535	343.8827	323.2538	301.4682	281.2386	268.6074	272.6067	283.6664	304.4340	328.2753	346.9626	(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				8.5000	19.6403	0.6300	0.7000	0.7700		51.0197 (76)		
West				3.7600	19.6403	0.6300	0.7000	0.7700		22.5687 (80)		
Solar gains	73.5884	143.9546	237.0727	345.7564	423.7375	433.7707	412.9674	354.7329	275.7254	170.8143	91.7561	60.5156 (83)
Total gains	431.5034	500.4081	580.9555	669.0102	725.2057	715.0094	681.5748	627.3396	559.3918	475.2483	420.0314	407.4781 (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	63.1892	63.3541	63.5166	64.2910	64.4380	65.1313	65.1313	65.2613	64.8625	64.4380	64.1414	63.8341	
alpha	5.2126	5.2236	5.2344	5.2861	5.2959	5.3421	5.3421	5.3508	5.3242	5.2959	5.2761	5.2556	
util living area	0.9991	0.9979	0.9932	0.9721	0.9020	0.7456	0.5733	0.6391	0.8879	0.9875	0.9982	0.9994	(86)
MIT	19.7386	19.8806	20.1366	20.4810	20.7750	20.9444	20.9888	20.9808	20.8501	20.4562	20.0358	19.7167	(87)
Th 2	20.0017	20.0040	20.0063	20.0171	20.0191	20.0285	20.0285	20.0303	20.0249	20.0191	20.0150	20.0107	(88)
util rest of house	0.9988	0.9972	0.9906	0.9610	0.8632	0.6586	0.4543	0.5178	0.8282	0.9809	0.9974	0.9991	(89)
MIT 2	18.8442	18.9878	19.2443	19.5908	19.8633	20.0023	20.0256	20.0245	19.9372	19.5724	19.1518	18.8296	(90)
Living area fraction									fLA = Living area / (4) =			0.2203	(91)
MIT	19.0412	19.1845	19.4409	19.7869	20.0641	20.2098	20.2378	20.2352	20.1384	19.7671	19.3466	19.0251	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0412	19.1845	19.4409	19.7869	20.0641	20.2098	20.2378	20.2352	20.1384	19.7671	19.3466	19.0251	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9984	0.9963	0.9887	0.9578	0.8652	0.6761	0.4808	0.5448	0.8364	0.9785	0.9966	0.9988	(94)
Ext temp.	430.8196	498.5611	574.3658	640.7482	627.4791	483.4452	327.6702	341.7618	467.8777	465.0512	418.6189	407.0021	(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	1383.8459	1337.4784	1208.5774	1004.5023	769.9748	510.9252	331.3187	348.6041	552.2325	843.8935	1132.5916	1377.6567	(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	709.0515	563.7525	471.8534	261.9029	106.0168	0.0000	0.0000	0.0000	0.0000	281.8587	514.0604	722.1670	(98)
Space heating per m2										(98) / (4) =		3630.6632	(98)
												42.5037	(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	856.1215	673.9680	690.8043	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8759	0.9340	0.9086	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	749.8452	629.4612	627.6714	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	932.1835	891.1435	829.5747	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	131.2835	194.6916	150.2160	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												476.1912	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)

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	32.8209	48.6729	37.5540	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling											119.0478 (107)
Space cooling per m2											1.3937 (108)
Energy for space heating											42.5037 (99)
Energy for space cooling											1.3937 (108)
Total											43.8973 (109)
Target Fabric Energy Efficiency (TFEE)											50.5 (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	42.7100 (1b)	x 2.3900 (2b)	= 102.0769 (1b) - (3b)
First floor	42.7100 (1c)	x 2.5600 (2c)	= 109.3376 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.4145 (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												3.5400
Infiltration rate												0.1770 (18)
Number of sides sheltered												2 (19)
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.1505 (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	0.1768	0.1655	0.1655	0.1505	0.1542	0.1467	0.1467	0.1429	0.1429	0.1542	0.1505	0.1542 (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 m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Front Door			2.1500	1.1000	2.3650		(26)					
Windows (Uw = 1.20)			12.2600	1.1450	14.0382		(27)					
Ground Floor			42.7100	0.1200	5.1252	84.0000	3587.6400 (28a)					
Brick and Block	91.4300	14.4100	77.0200	0.2400	18.4848	42.2200	3251.7844 (29a)					
Pitched Roof	42.7100		42.7100	0.1000	4.2710	9.1000	388.6610 (30)					
Total net area of external elements Aum(A, m2)			176.8500				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =	44.2842			(33)					
Party Wall 1			43.6100	0.0000	0.0000	110.0000	4797.1000 (32)					
Ground Floor Block			23.0400			75.0000	1728.0000 (32c)					
Ground Floor Stud			45.0800			9.0000	405.7200 (32c)					
First Floor Stud			93.6900			9.0000	843.2100 (32c)					
Internal Floor 1			42.7100			18.0000	768.7800 (32d)					
Internal Ceiling 1			42.7100			18.0000	768.7800 (32e)					
Heat capacity Cm = Sum(A x k)				(28) ... (30) + (32) + (32a) ... (32e) =	16539.6754		(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							193.6277 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.7223 (36)					
Total fabric heat loss				(33) + (36) =	55.0065		(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 34.8834	Feb 34.8834	Mar 34.8834	Apr 34.8834	May 34.8834	Jun 34.8834	Jul 34.8834	Aug 34.8834	Sep 34.8834	Oct 34.8834	Nov 34.8834	Dec 34.8834 (38)
Heat transfer coeff	89.8899	89.8899	89.8899	89.8899	89.8899	89.8899	89.8899	89.8899	89.8899	89.8899	89.8899	89.8899 (39)
Average = Sum(39)m / 12 =												89.8899 (39)
HLP	Jan 1.0523	Feb 1.0523	Mar 1.0523	Apr 1.0523	May 1.0523	Jun 1.0523	Jul 1.0523	Aug 1.0523	Sep 1.0523	Oct 1.0523	Nov 1.0523	Dec 1.0523 (40)
HLP (average)												1.0523 (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												2.5577 (42)
Average daily hot water use (litres/day)												94.9455 (43)
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

Daily hot water use	104.4400	100.6422	96.8444	93.0466	89.2488	85.4509	85.4509	89.2488	93.0466	96.8444	100.6422	104.4400 (44)
Energy conte	154.8815	135.4604	139.7830	121.8662	116.9335	100.9047	93.5031	107.2961	108.5776	126.5367	138.1247	149.9945 (45)
Energy content (annual)												1493.8621 (45)
Distribution loss (46)m = 0.15 x (45)m	23.2322	20.3191	20.9674	18.2799	17.5400	15.1357	14.0255	16.0944	16.2866	18.9805	20.7187	22.4992 (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	0.6707	0.6072	0.6092	0.5103	0.4696	0.3880	0.3595	0.4309	0.4546	0.5514	0.6191	0.6495 (61)
Total heat required for water heating calculated for each month	155.5522	136.0676	140.3922	122.3765	117.4031	101.2927	93.8626	107.7271	109.0322	127.0882	138.7438	150.6440 (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	155.5522	136.0676	140.3922	122.3765	117.4031	101.2927	93.8626	107.7271	109.0322	127.0882	138.7438	150.6440 (64)
RHI water heating demand												1500.1822 (64)
Heat gains from water heating, kWh/month	51.6658	45.1924	46.6301	40.6481	38.9978	33.6478	31.1797	35.7837	36.2157	42.2113	46.0812	50.0356 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	54.7930	48.6667	39.5784	29.9634	22.3980	18.9093	20.4322	26.5585	35.6468	45.2618	52.8272	56.3159 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	343.8733	347.4417	338.4496	319.3065	295.1419	272.4305	257.2579	253.6895	262.6816	281.8247	305.9893	328.7007 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039 (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)	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082 (71)
Water heating gains (Table 5)	69.4433	67.2506	62.6749	56.4557	52.4164	46.7331	41.9081	48.0964	50.2996	56.7356	64.0017	67.2521 (72)
Total internal gains	575.1677	570.4169	547.7609	512.7836	477.0143	445.1309	426.6562	435.4025	455.6860	490.8802	529.8763	559.3268 (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					8.5000	25.1733	0.6300	0.7000	0.7700	65.3928 (76)		
West					3.7600	25.1733	0.6300	0.7000	0.7700	28.9267 (80)		

Solar gains	94.3195	156.9547	262.3153	382.0508	438.8355	496.2949	454.2655	408.3994	318.7253	200.7860	117.2204	73.4171 (83)
Total gains	669.4872	727.3716	810.0762	894.8345	915.8498	941.4258	880.9218	843.8019	774.4113	691.6662	647.0967	632.7439 (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	51.1109	51.1109	51.1109	51.1109	51.1109	51.1109	51.1109	51.1109	51.1109	51.1109	51.1109	51.1109
Feb	4.4074	4.4074	4.4074	4.4074	4.4074	4.4074	4.4074	4.4074	4.4074	4.4074	4.4074	4.4074
Mar	0.9786	0.9686	0.9355	0.8500	0.6994	0.4763	0.3349	0.3389	0.6123	0.8691	0.9597	0.9821 (86)
Apr	20.0028	20.1195	20.3891	20.7003	20.9049	20.9862	20.9978	20.9977	20.9600	20.7280	20.3249	19.9690 (87)
May	20.0400	20.0400	20.0400	20.0400	20.0400	20.0400	20.0400	20.0400	20.0400	20.0400	20.0400	20.0400 (88)
Jun	0.9731	0.9607	0.9193	0.8145	0.6354	0.3913	0.2384	0.2383	0.5217	0.8276	0.9476	0.9774 (89)
Jul	19.1558	19.2696	19.5292	19.8147	19.9827	20.0348	20.0396	20.0396	20.0221	19.8467	19.4722	19.1229 (90)
Aug	19.3424	19.4569	19.7186	20.0098	20.1859	20.2444	20.2507	20.2507	20.2288	20.0409	19.6601	19.3093 (91)
Sep												0.0000 (92)
Oct												19.3093 (93)
Nov												
Dec												

8. Space heating requirement

Utilisation	0.9680	0.9547	0.9130	0.8132	0.6458	0.4097	0.2598	0.2606	0.5404	0.8277	0.9417	0.9728 (94)
Useful gains	648.0949	694.4501	739.5782	727.6962	591.4220	385.7487	228.8297	219.8535	418.5046	572.4746	609.3575	615.5443 (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	1235.3016	1209.6350	1089.3414	890.7935	636.9485	390.5175	229.2798	220.2913	434.0564	713.8069	994.1888	1223.3391 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	436.8818	346.2043	260.2238	117.4301	33.8717	0.0000	0.0000	0.0000	0.0000	105.1512	277.0785	452.1993 (98)
Space heating												2029.0407 (98)
RHI space heating demand												2029 (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	42.7100 (1b)	x 2.3900 (2b)	= 102.0769 (1b) - (3b)
First floor	42.7100 (1c)	x 2.5600 (2c)	= 109.3376 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.4145 (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					3.5400
Infiltration rate					0.1770 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.1505 (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	0.1918	0.1881	0.1843	0.1655	0.1617	0.1429	0.1429	0.1392	0.1505	0.1617	0.1693	0.1768 (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 m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Front Door			2.1500	1.1000	2.3650		(26)					
Windows (Uw = 1.20)			12.2600	1.1450	14.0382		(27)					
Ground Floor			42.7100	0.1200	5.1252	84.0000	3587.6400 (28a)					
Brick and Block	91.4300	14.4100	77.0200	0.2400	18.4848	42.2200	3251.7844 (29a)					
Pitched Roof	42.7100		42.7100	0.1000	4.2710	9.1000	388.6610 (30)					
Total net area of external elements Aum(A, m2)			176.8500				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =	44.2842			(33)					
Party Wall 1			43.6100	0.0000	0.0000	110.0000	4797.1000 (32)					
Ground Floor Block			23.0400			75.0000	1728.0000 (32c)					
Ground Floor Stud			45.0800			9.0000	405.7200 (32c)					
First Floor Stud			93.6900			9.0000	843.2100 (32c)					
Internal Floor 1			42.7100			18.0000	768.7800 (32d)					
Internal Ceiling 1			42.7100			18.0000	768.7800 (32e)					
Heat capacity Cm = Sum(A x k)				(28) ... (30) + (32) + (32a) ... (32e) =	16539.6754		(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							193.6277 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.7223 (36)					
Total fabric heat loss				(33) + (36) =			55.0065 (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	34.8834	34.8834	34.8834	34.8834	34.8834	34.8834	34.8834	34.8834	34.8834	34.8834	34.8834	34.8834 (38)
Average = Sum(39)m / 12 =	89.8899	89.8899	89.8899	89.8899	89.8899	89.8899	89.8899	89.8899	89.8899	89.8899	89.8899	89.8899 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0523	1.0523	1.0523	1.0523	1.0523	1.0523	1.0523	1.0523	1.0523	1.0523	1.0523	1.0523 (40)
HLP (average)												1.0523 (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												2.5577 (42)
Average daily hot water use (litres/day)												94.9455 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Daily hot water use	104.4400	100.6422	96.8444	93.0466	89.2488	85.4509	85.4509	89.2488	93.0466	96.8444	100.6422	104.4400 (44)
Energy conte	154.8815	135.4604	139.7830	121.8662	116.9335	100.9047	93.5031	107.2961	108.5776	126.5367	138.1247	149.9945 (45)
Energy content (annual)										Total = Sum (45)m =		1493.8621 (45)
Distribution loss (46)m = 0.15 x (45)m	23.2322	20.3191	20.9674	18.2799	17.5400	15.1357	14.0255	16.0944	16.2866	18.9805	20.7187	22.4992 (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	0.6707	0.6072	0.6092	0.5103	0.4696	0.3880	0.3595	0.4309	0.4546	0.5514	0.6191	0.6495 (61)
Total heat required for water heating calculated for each month	155.5522	136.0676	140.3922	122.3765	117.4031	101.2927	93.8626	107.7271	109.0322	127.0882	138.7438	150.6440 (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	155.5522	136.0676	140.3922	122.3765	117.4031	101.2927	93.8626	107.7271	109.0322	127.0882	138.7438	150.6440 (64)
Heat gains from water heating, kWh/month	51.6658	45.1924	46.6301	40.6481	38.9978	33.6478	31.1797	35.7837	36.2157	42.2113	46.0812	50.0356 (65)
										Total per year (kWh/year) = Sum (64)m =		1500.1822 (64)

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	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	54.7930	48.6667	39.5784	29.9634	22.3980	18.9093	20.4322	26.5585	35.6468	45.2618	52.8272	56.3159 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	343.8733	347.4417	338.4496	319.3065	295.1419	272.4305	257.2579	253.6895	262.6816	281.8247	305.9893	328.7007 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039 (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)	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082 (71)
Water heating gains (Table 5)	69.4433	67.2506	62.6749	56.4557	52.4164	46.7331	41.9081	48.0964	50.2996	56.7356	64.0017	67.2521 (72)
Total internal gains	575.1677	570.4169	547.7609	512.7836	477.0143	445.1309	426.6562	435.4025	455.6860	490.8802	529.8763	559.3268 (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			8.5000	19.6403		0.6300		0.7000		0.7700		51.0197 (76)
West			3.7600	19.6403		0.6300		0.7000		0.7700		22.5687 (80)
Solar gains	73.5884	143.9546	237.0727	345.7564	423.7375	433.7707	412.9674	354.7329	275.7254	170.8143	91.7561	60.5156 (83)
Total gains	648.7561	714.3715	784.8337	858.5401	900.7518	878.9016	839.6236	790.1354	731.4114	661.6944	621.6325	619.8423 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	51.1109	51.1109	51.1109	51.1109	51.1109	51.1109	51.1109	51.1109	51.1109	51.1109	51.1109	51.1109
util living area	4.4074	4.4074	4.4074	4.4074	4.4074	4.4074	4.4074	4.4074	4.4074	4.4074	4.4074	4.4074
	0.9858	0.9769	0.9545	0.8971	0.7834	0.6157	0.4619	0.5085	0.7424	0.9247	0.9763	0.9883 (86)
MIT	19.8217	19.9752	20.2420	20.5658	20.8218	20.9533	20.9895	20.9840	20.8943	20.5583	20.1212	19.7725 (87)
Th 2	20.0400	20.0400	20.0400	20.0400	20.0400	20.0400	20.0400	20.0400	20.0400	20.0400	20.0400	20.0400 (88)
util rest of house	0.9823	0.9714	0.9434	0.8719	0.7335	0.5369	0.3654	0.4091	0.6698	0.9005	0.9695	0.9854 (89)
MIT 2	18.9766	19.1278	19.3880	19.6942	19.9183	20.0166	20.0367	20.0345	19.9797	19.6944	19.2735	18.9280 (90)
Living area fraction									fLA = Living area / (4) =			0.2203 (91)
MIT	19.1628	19.3145	19.5762	19.8862	20.1174	20.2230	20.2466	20.2437	20.1812	19.8847	19.4603	19.1141 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1628	19.3145	19.5762	19.8862	20.1174	20.2230	20.2466	20.2437	20.1812	19.8847	19.4603	19.1141 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9783	0.9661	0.9369	0.8672	0.7379	0.5526	0.3866	0.4308	0.6814	0.8959	0.9644	0.9818 (94)
Ext temp.	634.6473	690.1684	735.2826	744.5610	664.6716	485.7049	324.6074	340.3773	498.3796	592.7794	599.4947	608.5459 (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	1336.0111	1295.7175	1175.4146	987.5497	756.6372	505.4477	327.7914	345.5110	546.6407	834.6009	1111.0617	1340.6249 (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	521.8146	406.9290	327.4582	174.9519	68.4224	0.0000	0.0000	0.0000	0.0000	179.9152	368.3282	544.6667 (98)
Space heating per m2										(98) / (4) =		30.3499 (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 %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2874.1534 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	521.8146	406.9290	327.4582	174.9519	68.4224	0.0000	0.0000	0.0000	0.0000	179.9152	368.3282	544.6667	(98)
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000	(210)
Space heating fuel (main heating system)	578.5085	451.1408	363.0357	193.9600	75.8563	0.0000	0.0000	0.0000	0.0000	199.4625	408.3462	603.8434	(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	155.5522	136.0676	140.3922	122.3765	117.4031	101.2927	93.8626	107.7271	109.0322	127.0882	138.7438	150.6440	(64)
Efficiency of water heater (217)m	86.6075	86.2941	85.5623	83.9582	80.9608	76.4000	76.4000	76.4000	76.4000	83.9247	85.9520	86.8030	(216)
Fuel for water heating, kWh/month	179.6059	157.6789	164.0818	145.7588	145.0123	132.5821	122.8568	141.0040	142.7123	151.4313	161.4202	173.5470	(219)
Water heating fuel used												1817.6915	(219)
Annual totals kWh/year													
Space heating fuel - main system												2874.1534	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.2380)													
mechanical ventilation fans (SFP = 0.2380)												61.3863	(230a)
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												136.3863	(231)
Electricity for lighting (calculated in Appendix L)												387.0649	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.09 * 908 * 1.00) =										-791.6489		-791.6489	(233)
Total delivered energy for all uses												4423.6472	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2874.1534	3.4800	100.0205 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1817.6915	3.4800	63.2557 (247)
Mechanical ventilation fans	61.3863	13.1900	8.0969 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	387.0649	13.1900	51.0539 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-791.6489	13.1900	-104.4185 (252)
Total energy cost			247.9009 (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] =	0.7983 (257)
SAP value	88.8633	
SAP rating (Section 12)	89	(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	2874.1534	0.2160	620.8171 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1817.6915	0.2160	392.6214 (264)
Space and water heating			1013.4385 (265)
Pumps and fans	136.3863	0.5190	70.7845 (267)
Energy for lighting	387.0649	0.5190	200.8867 (268)
Energy saving/generation technologies			
PV Unit	-791.6489	0.5190	-410.8658 (269)
Total kg/year			874.2439 (272)
CO2 emissions per m2			10.2300 (273)
EI value			91.0176
EI rating			91 (274)
EI band			B

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CALCULATION OF ENERGY RATINGS 09 Jan 2014

Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9020 = 3.858$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9020 = 0.2395$, stars = 4
Water heating energy efficiency	$3.48 / 0.8214 = 4.237$, stars = 4
Water heating environmental impact	$0.216 / 0.8214 = 0.2630$, 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	42.7100 (1b)	x 2.3900 (2b)	= 102.0769 (1b) - (3b)
First floor	42.7100 (1c)	x 2.5600 (2c)	= 109.3376 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.4145 (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					3.5400
Infiltration rate					0.1770 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)]	=	0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20)	=	0.1505 (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	0.1768	0.1655	0.1655	0.1505	0.1542	0.1467	0.1467	0.1429	0.1429	0.1542	0.1505	0.1542 (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 m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Front Door			2.1500	1.1000	2.3650		(26)					
Windows (Uw = 1.20)			12.2600	1.1450	14.0382		(27)					
Ground Floor			42.7100	0.1200	5.1252	84.0000	3587.6400 (28a)					
Brick and Block	91.4300	14.4100	77.0200	0.2400	18.4848	42.2200	3251.7844 (29a)					
Pitched Roof	42.7100		42.7100	0.1000	4.2710	9.1000	388.6610 (30)					
Total net area of external elements Aum(A, m2)			176.8500				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =	44.2842			(33)					
Party Wall 1			43.6100	0.0000	0.0000	110.0000	4797.1000 (32)					
Ground Floor Block			23.0400			75.0000	1728.0000 (32c)					
Ground Floor Stud			45.0800			9.0000	405.7200 (32c)					
First Floor Stud			93.6900			9.0000	843.2100 (32c)					
Internal Floor 1			42.7100			18.0000	768.7800 (32d)					
Internal Ceiling 1			42.7100			18.0000	768.7800 (32e)					
Heat capacity Cm = Sum(A x k)				(28) ... (30) + (32) + (32a) ... (32e) =	16539.6754		(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							193.6277 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.7223 (36)					
Total fabric heat loss				(33) + (36) =	55.0065		(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	34.8834	34.8834	34.8834	34.8834	34.8834	34.8834	34.8834	34.8834	34.8834	34.8834	34.8834	34.8834 (38)
Average = Sum(39)m / 12 =	89.8899	89.8899	89.8899	89.8899	89.8899	89.8899	89.8899	89.8899	89.8899	89.8899	89.8899	89.8899 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0523	1.0523	1.0523	1.0523	1.0523	1.0523	1.0523	1.0523	1.0523	1.0523	1.0523	1.0523 (40)
HLP (average)												1.0523 (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												2.5577 (42)
Average daily hot water use (litres/day)												94.9455 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Daily hot water use	104.4400	100.6422	96.8444	93.0466	89.2488	85.4509	85.4509	89.2488	93.0466	96.8444	100.6422	104.4400 (44)
Energy conte	154.8815	135.4604	139.7830	121.8662	116.9335	100.9047	93.5031	107.2961	108.5776	126.5367	138.1247	149.9945 (45)
Energy content (annual)										Total = Sum (45)m =		1493.8621 (45)
Distribution loss (46)m = 0.15 x (45)m	23.2322	20.3191	20.9674	18.2799	17.5400	15.1357	14.0255	16.0944	16.2866	18.9805	20.7187	22.4992 (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	0.6707	0.6072	0.6092	0.5103	0.4696	0.3880	0.3595	0.4309	0.4546	0.5514	0.6191	0.6495 (61)
Total heat required for water heating calculated for each month	155.5522	136.0676	140.3922	122.3765	117.4031	101.2927	93.8626	107.7271	109.0322	127.0882	138.7438	150.6440 (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	155.5522	136.0676	140.3922	122.3765	117.4031	101.2927	93.8626	107.7271	109.0322	127.0882	138.7438	150.6440 (64)
Heat gains from water heating, kWh/month	51.6658	45.1924	46.6301	40.6481	38.9978	33.6478	31.1797	35.7837	36.2157	42.2113	46.0812	50.0356 (65)
										Total per year (kWh/year) = Sum (64)m =		1500.1822 (64)

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	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	54.7930	48.6667	39.5784	29.9634	22.3980	18.9093	20.4322	26.5585	35.6468	45.2618	52.8272	56.3159 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	343.8733	347.4417	338.4496	319.3065	295.1419	272.4305	257.2579	253.6895	262.6816	281.8247	305.9893	328.7007 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039 (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)	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082 (71)
Water heating gains (Table 5)	69.4433	67.2506	62.6749	56.4557	52.4164	46.7331	41.9081	48.0964	50.2996	56.7356	64.0017	67.2521 (72)
Total internal gains	575.1677	570.4169	547.7609	512.7836	477.0143	445.1309	426.6562	435.4025	455.6860	490.8802	529.8763	559.3268 (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			8.5000		25.1733		0.6300		0.7000		0.7700		65.3928	(76)
West			3.7600		25.1733		0.6300		0.7000		0.7700		28.9267	(80)
Solar gains	94.3195	156.9547	262.3153	382.0508	438.8355	496.2949	454.2655	408.3994	318.7253	200.7860	117.2204		73.4171	(83)
Total gains	669.4872	727.3716	810.0762	894.8345	915.8498	941.4258	880.9218	843.8019	774.4113	691.6662	647.0967		632.7439	(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	51.1109	51.1109	51.1109	51.1109	51.1109	51.1109	51.1109	51.1109	51.1109	51.1109	51.1109	51.1109
alpha	4.4074	4.4074	4.4074	4.4074	4.4074	4.4074	4.4074	4.4074	4.4074	4.4074	4.4074	4.4074
util living area	0.9786	0.9686	0.9355	0.8500	0.6994	0.4763	0.3349	0.3389	0.6123	0.8691	0.9597	0.9821 (86)
MIT	20.0028	20.1195	20.3891	20.7003	20.9049	20.9862	20.9978	20.9977	20.9600	20.7280	20.3249	19.9690 (87)
Th 2	20.0400	20.0400	20.0400	20.0400	20.0400	20.0400	20.0400	20.0400	20.0400	20.0400	20.0400	20.0400 (88)
util rest of house	0.9731	0.9607	0.9193	0.8145	0.6354	0.3913	0.2384	0.2383	0.5217	0.8276	0.9476	0.9774 (89)
MIT 2	19.1558	19.2692	19.5292	19.8147	19.9827	20.0348	20.0396	20.0396	20.0221	19.8467	19.4722	19.1229 (90)
Living area fraction	19.3424	19.4569	19.7186	20.0098	20.1859	20.2444	20.2507	20.2507	fLA = Living area / (4) =	20.2288	20.0409	19.6601 (91)
MIT	19.3424	19.4569	19.7186	20.0098	20.1859	20.2444	20.2507	20.2507	20.2288	20.0409	19.6601	19.3093 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3424	19.4569	19.7186	20.0098	20.1859	20.2444	20.2507	20.2507	20.2288	20.0409	19.6601	19.3093 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9680	0.9547	0.9130	0.8132	0.6458	0.4097	0.2598	0.2606	0.5404	0.8277	0.9417	0.9728 (94)
Ext temp.	648.0949	694.4501	739.5782	727.6962	591.4220	385.7487	228.8297	219.8535	418.5046	572.4746	609.3575	615.5443 (95)
Heat loss rate W	5.6000	6.0000	7.6000	10.1000	13.1000	15.9000	17.7000	17.8000	15.4000	12.1000	8.6000	5.7000 (96)
Month fracti	1235.3016	1209.6350	1089.3414	890.7935	636.9485	390.5175	229.2798	220.2913	434.0564	713.8069	994.1888	1223.3391 (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	436.8818	346.2043	260.2238	117.4301	33.8717	0.0000	0.0000	0.0000	0.0000	105.1512	277.0785	452.1993 (98)
Space heating per m2												2029.0407 (98)
										(98) / (4) =		23.7537 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												90.2000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												2249.4908	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	436.8818	346.2043	260.2238	117.4301	33.8717	0.0000	0.0000	0.0000	0.0000	105.1512	277.0785	452.1993	(98)
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000	(210)
Space heating fuel (main heating system)	484.3479	383.8185	288.4965	130.1885	37.5518	0.0000	0.0000	0.0000	0.0000	116.5756	307.1824	501.3297	(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	155.5522	136.0676	140.3922	122.3765	117.4031	101.2927	93.8626	107.7271	109.0322	127.0882	138.7438	150.6440	(64)
Efficiency of water heater	86.1158	85.8261	84.8303	82.5873	79.1100	76.4000	76.4000	76.4000	76.4000	82.0862	85.0728	86.3045	(216)
(217)m													(217)
Fuel for water heating, kWh/month	180.6314	158.5387	165.4977	148.1782	148.4049	132.5821	122.8568	141.0040	142.7123	154.8228	163.0884	174.5495	(219)
Water heating fuel used												1832.8669	(219)
Annual totals kWh/year													
Space heating fuel - main system												2249.4908	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.2380)													
mechanical ventilation fans (SFP = 0.2380)												61.3863	(230a)
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												136.3863	(231)
Electricity for lighting (calculated in Appendix L)												387.0649	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.09 * 1030 * 1.00) =										-898.2118		-898.2118	(233)
Total delivered energy for all uses												3707.5971	(238)

10a. Fuel costs - using BEDF prices (551)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2249.4908	7.3800	166.0124 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1832.8669	7.3800	135.2656 (247)
Mechanical ventilation fans	61.3863	28.6600	17.5933 (249)
Pumps and fans for heating	75.0000	28.6600	21.4950 (249)
Energy for lighting	387.0649	28.6600	110.9328 (250)
Additional standing charges			107.0000 (251)
Energy saving/generation technologies			
PV Unit	-898.2118	28.6600	-257.4275 (252)
Total energy cost			300.8716 (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	2249.4908	0.2160	485.8900 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1832.8669	0.2160	395.8993 (264)
Space and water heating			881.7893 (265)
Pumps and fans	136.3863	0.5190	70.7845 (267)
Energy for lighting	387.0649	0.5190	200.8867 (268)
Energy saving/generation technologies			
PV Unit	-898.2118	0.5190	-466.1719 (269)
Total kg/year			687.2885 (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	2249.4908	1.2200	2744.3788 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1832.8669	1.2200	2236.0977 (264)
Space and water heating			4980.4765 (265)
Pumps and fans	136.3863	3.0700	418.7060 (267)
Energy for lighting	387.0649	3.0700	1188.2891 (268)

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Energy saving/generation technologies			
PV Unit	-898.2118	3.0700	-2757.5102 (269)
Primary energy kWh/year			3829.9614 (272)
Primary energy kWh/m ² /year			44.8368 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:	B 89
Current environmental impact rating:	B 91

(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	-£ 65	-205 kg (29.8%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£65 2.40 kg/m ²	B 90	A 93
Total Savings	£65 2.40 kg/m ²		

Potential energy efficiency rating:	B 90
Potential environmental impact rating:	A 93

Fuel prices for cost data on this page from database revision number 551 TEST (31 Jul 2024)
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	£150	£164	-£14
Mains gas	£408	£329	£79
Space heating	£312	£312	-£0
Water heating	£135	£71	£65
Lighting	£111	£111	£0
Generated (PV)	-£257	-£257	£0
Total cost of fuels	£301	£236	£65
Total cost of uses	£301	£237	£65
Delivered energy	43 kWh/m ²	31 kWh/m ²	12 kWh/m ²
Carbon dioxide emissions	0.7 tonnes	0.5 tonnes	0.2 tonnes
CO2 emissions per m ²	8 kg/m ²	6 kg/m ²	2 kg/m ²
Primary energy	45 kWh/m ²	31 kWh/m ²	13 kWh/m ²

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	42.7100 (1b)	x 2.3900 (2b)	= 102.0769 (1b) - (3b)
First floor	42.7100 (1c)	x 2.5600 (2c)	= 109.3376 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.4145 (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					3.5400
Infiltration rate					0.1770 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.1505 (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	0.1918	0.1881	0.1843	0.1655	0.1617	0.1429	0.1429	0.1392	0.1505	0.1617	0.1693	0.1768 (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 m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Front Door			2.1500	1.1000	2.3650		(26)					
Windows (Uw = 1.20)			12.2600	1.1450	14.0382		(27)					
Ground Floor			42.7100	0.1200	5.1252	84.0000	3587.6400 (28a)					
Brick and Block	91.4300	14.4100	77.0200	0.2400	18.4848	42.2200	3251.7844 (29a)					
Pitched Roof	42.7100		42.7100	0.1000	4.2710	9.1000	388.6610 (30)					
Total net area of external elements Aum(A, m2)			176.8500				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =	44.2842			(33)					
Party Wall 1			43.6100	0.0000	0.0000	110.0000	4797.1000 (32)					
Ground Floor Block			23.0400			75.0000	1728.0000 (32c)					
Ground Floor Stud			45.0800			9.0000	405.7200 (32c)					
First Floor Stud			93.6900			9.0000	843.2100 (32c)					
Internal Floor 1			42.7100			18.0000	768.7800 (32d)					
Internal Ceiling 1			42.7100			18.0000	768.7800 (32e)					
Heat capacity Cm = Sum(A x k)				(28) ... (30) + (32) + (32a) ... (32e) =	16539.6754		(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							193.6277 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.7223 (36)					
Total fabric heat loss					(33) + (36) =		55.0065 (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	34.8834	34.8834	34.8834	34.8834	34.8834	34.8834	34.8834	34.8834	34.8834	34.8834	34.8834	34.8834 (38)
Average = Sum(39)m / 12 =	89.8899	89.8899	89.8899	89.8899	89.8899	89.8899	89.8899	89.8899	89.8899	89.8899	89.8899	89.8899 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0523	1.0523	1.0523	1.0523	1.0523	1.0523	1.0523	1.0523	1.0523	1.0523	1.0523	1.0523 (40)
HLP (average)												1.0523 (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												2.5577 (42)
Average daily hot water use (litres/day)												94.9455 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Daily hot water use	104.4400	100.6422	96.8444	93.0466	89.2488	85.4509	85.4509	89.2488	93.0466	96.8444	100.6422	104.4400 (44)
Energy conte	154.8815	135.4604	139.7830	121.8662	116.9335	100.9047	93.5031	107.2961	108.5776	126.5367	138.1247	149.9945 (45)
Energy content (annual)												1493.8621 (45)
Distribution loss (46)m = 0.15 x (45)m	23.2322	20.3191	20.9674	18.2799	17.5400	15.1357	14.0255	16.0944	16.2866	18.9805	20.7187	22.4992 (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	0.6707	0.6072	0.6092	0.5103	0.4696	0.3880	0.3595	0.4309	0.4546	0.5514	0.6191	0.6495 (61)
Total heat required for water heating calculated for each month	155.5522	136.0676	140.3922	122.3765	117.4031	101.2927	93.8626	107.7271	109.0322	127.0882	138.7438	150.6440 (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												1.2140 (H8)
Utilisation factor												0.5612 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												94.9455 (H14)
Volume ratio Veff/V												0.7899 (H15)
Solar storage volume factor												0.9528 (H16)
Solar input												-852.7226 (H17)
Solar input	-24.7273	-41.2627	-70.2751	-94.1824	-116.3545	-114.3950	-112.8832	-98.6266	-77.2444	-52.7489	-29.3301	-20.6925 (63)
Solar input (sum of months) = Sum (63)m =												-852.7226 (63)
Output from w/h	130.8250	94.8049	70.1171	28.1940	1.0487	0.0000	0.0000	9.1004	31.7878	74.3393	109.4138	129.9515 (64)
Total per year (kWh/year) = Sum (64)m =												679.5825 (64)
Heat gains from water heating, kWh/month	51.6658	45.1924	46.6301	40.6481	38.9978	33.6478	31.1797	35.7837	36.2157	42.2113	46.0812	50.0356 (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	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	54.7930	48.6667	39.5784	29.9634	22.3980	18.9093	20.4322	26.5585	35.6468	45.2618	52.8272	56.3159	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	343.8733	347.4417	338.4496	319.3065	295.1419	272.4305	257.2579	253.6895	262.6816	281.8247	305.9893	328.7007	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	(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)	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	(71)
Water heating gains (Table 5)	69.4433	67.2506	62.6749	56.4557	52.4164	46.7331	41.9081	48.0964	50.2996	56.7356	64.0017	67.2521	(72)
Total internal gains	575.1677	570.4169	547.7609	512.7836	477.0143	445.1309	426.6562	435.4025	455.6860	490.8802	529.8763	559.3268	(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					8.5000	19.6403	0.6300	0.7000	0.7700		51.0197 (76)	
West					3.7600	19.6403	0.6300	0.7000	0.7700		22.5687 (80)	

Solar gains	73.5884	143.9546	237.0727	345.7564	423.7375	433.7707	412.9674	354.7329	275.7254	170.8143	91.7561	60.5156 (83)
Total gains	648.7561	714.3715	784.8337	858.5401	900.7518	878.9016	839.6236	790.1354	731.4114	661.6944	621.6325	619.8423 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
alpha	51.1109	51.1109	51.1109	51.1109	51.1109	51.1109	51.1109	51.1109	51.1109	51.1109	51.1109	51.1109	
util living area	4.4074	4.4074	4.4074	4.4074	4.4074	4.4074	4.4074	4.4074	4.4074	4.4074	4.4074	4.4074	
	0.9858	0.9769	0.9545	0.8971	0.7834	0.6157	0.4619	0.5085	0.7424	0.9247	0.9763	0.9883	(86)
MIT	19.8217	19.9752	20.2420	20.5658	20.8218	20.9533	20.9895	20.9840	20.8943	20.5583	20.1212	19.7725	(87)
Th 2	20.0400	20.0400	20.0400	20.0400	20.0400	20.0400	20.0400	20.0400	20.0400	20.0400	20.0400	20.0400	(88)
util rest of house	0.9823	0.9714	0.9434	0.8719	0.7335	0.5369	0.3654	0.4091	0.6698	0.9005	0.9695	0.9854	(89)
MIT 2	18.9766	19.1278	19.3880	19.6942	19.9183	20.0166	20.0367	20.0345	19.9797	19.6944	19.2735	18.9280	(90)
Living area fraction									fLA = Living area / (4) =			0.2203	(91)
MIT	19.1628	19.3145	19.5762	19.8862	20.1174	20.2230	20.2466	20.2437	20.1812	19.8847	19.4603	19.1141	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1628	19.3145	19.5762	19.8862	20.1174	20.2230	20.2466	20.2437	20.1812	19.8847	19.4603	19.1141	(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	0.9783	0.9661	0.9369	0.8672	0.7379	0.5526	0.3866	0.4308	0.6814	0.8959	0.9644	0.9818	(94)
Useful gains	634.6473	690.1684	735.2826	744.5610	664.6716	485.7049	324.6074	340.3773	498.3796	592.7794	599.4947	608.5459	(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													
	1336.0111	1295.7175	1175.4146	987.5497	756.6372	505.4477	327.7914	345.5110	546.6407	834.6009	1111.0617	1340.6249	(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													
	521.8146	406.9290	327.4582	174.9519	68.4224	0.0000	0.0000	0.0000	0.0000	179.9152	368.3282	544.6667	(98)
Space heating													
Space heating per m2												2592.4864	(98)
										(98) / (4) =		30.3499	(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 %)													90.2000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													2874.1534	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	521.8146	406.9290	327.4582	174.9519	68.4224	0.0000	0.0000	0.0000	0.0000	179.9152	368.3282	544.6667	(98)	
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000	(210)	
Space heating fuel (main heating system)	578.5085	451.1408	363.0357	193.9600	75.8563	0.0000	0.0000	0.0000	0.0000	199.4625	408.3462	603.8434	(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	130.8250	94.8049	70.1171	28.1940	1.0487	0.0000	0.0000	9.1004	31.7878	74.3393	109.4138	129.9515	(64)	
Efficiency of water heater	87.0482	87.2230	87.4153	87.9941	89.9547	76.4000	76.4000	76.4000	76.4000	85.6753	86.6168	76.4000	(216)	
(217)m	87.0482	87.2230	87.4153	87.9941	89.9547	76.4000	76.4000	76.4000	76.4000	85.6753	86.6168	76.4000	(217)	
Fuel for water heating, kWh/month	150.2903	108.6925	80.2115	32.0408	1.1658	0.0000	0.0000	11.9116	41.6071	86.7687	126.3193	149.0833	(219)	
Water heating fuel used														
Annual totals kWh/year														
Space heating fuel - main system													2874.1534	(211)
Space heating fuel - secondary													0.0000	(215)
Electricity for pumps and fans:														
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.2380)														
mechanical ventilation fans (SFP = 0.2380)													61.3863	(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													186.3863	(231)
Electricity for lighting (calculated in Appendix L)													387.0649	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 1.09 * 908 * 1.00) =													-791.6489	(233)
Total delivered energy for all uses													3444.0464	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2874.1534	3.4800	100.0205	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	788.0907	3.4800	27.4256	(247)
Mechanical ventilation fans	61.3863	13.1900	8.0969	(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	387.0649	13.1900	51.0539	(250)
Additional standing charges			120.0000	(251)
Energy saving/generation technologies				
PV Unit	-791.6489	13.1900	-104.4185	(252)
Total energy cost			218.6658	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):			0.4200	(256)
Energy cost factor (ECF)			0.7042	(257)
SAP value		[(255) x (256)] / [(4) + 45.0] =	90.1766	
SAP rating (Section 12)			90	(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	2874.1534	0.2160	620.8171 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	788.0907	0.2160	170.2276 (264)
Space and water heating			791.0447 (265)
Pumps and fans	186.3863	0.5190	96.7345 (267)
Energy for lighting	387.0649	0.5190	200.8867 (268)
Energy saving/generation technologies			
PV Unit	-791.6489	0.5190	-410.8658 (269)
Total kg/year			677.8001 (272)
CO2 emissions per m2			7.9300 (273)
EI value			93.0359
EI rating			93 (274)
EI band			A

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	42.7100 (1b)	x 2.3900 (2b)	= 102.0769 (1b) - (3b)
First floor	42.7100 (1c)	x 2.5600 (2c)	= 109.3376 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.4145 (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												3.5400	
Infiltration rate												0.1770 (18)	
Number of sides sheltered												2 (19)	
Shelter factor									(20) = 1 - [0.075 x (19)] =			0.8500 (20)	
Infiltration rate adjusted to include shelter factor									(21) = (18) x (20) =			0.1505 (21)	
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	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)	
Adj infilt rate	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)	
	0.1768	0.1655	0.1655	0.1505	0.1542	0.1467	0.1467	0.1429	0.1429	0.1542	0.1505	0.1542 (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 m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
Front Door			2.1500	1.1000	2.3650			(26)					
Windows (Uw = 1.20)			12.2600	1.1450	14.0382			(27)					
Ground Floor			42.7100	0.1200	5.1252	84.0000	3587.6400	(28a)					
Brick and Block	91.4300	14.4100	77.0200	0.2400	18.4848	42.2200	3251.7844	(29a)					
Pitched Roof	42.7100		42.7100	0.1000	4.2710	9.1000	388.6610	(30)					
Total net area of external elements Aum(A, m2)			176.8500					(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =	44.2842				(33)					
Party Wall 1			43.6100	0.0000	0.0000	110.0000	4797.1000	(32)					
Ground Floor Block			23.0400			75.0000	1728.0000	(32c)					
Ground Floor Stud			45.0800			9.0000	405.7200	(32c)					
First Floor Stud			93.6900			9.0000	843.2100	(32c)					
Internal Floor 1			42.7100			18.0000	768.7800	(32d)					
Internal Ceiling 1			42.7100			18.0000	768.7800	(32e)					
Heat capacity Cm = Sum(A x k)			(28) ... (30) + (32) + (32a) ... (32e) =	16539.6754				(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							193.6277	(35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.7223	(36)					
Total fabric heat loss			(33) + (36) =	55.0065				(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 34.8834	Feb 34.8834	Mar 34.8834	Apr 34.8834	May 34.8834	Jun 34.8834	Jul 34.8834	Aug 34.8834	Sep 34.8834	Oct 34.8834	Nov 34.8834	Dec 34.8834	(38)
Heat transfer coeff	89.8899	89.8899	89.8899	89.8899	89.8899	89.8899	89.8899	89.8899	89.8899	89.8899	89.8899	89.8899	(39)
Average = Sum(39)m / 12 =													(39)
HLP	Jan 1.0523	Feb 1.0523	Mar 1.0523	Apr 1.0523	May 1.0523	Jun 1.0523	Jul 1.0523	Aug 1.0523	Sep 1.0523	Oct 1.0523	Nov 1.0523	Dec 1.0523	(40)
HLP (average)													(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												2.5577 (42)
Average daily hot water use (litres/day)												94.9455 (43)
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

Daily hot water use	104.4400	100.6422	96.8444	93.0466	89.2488	85.4509	85.4509	89.2488	93.0466	96.8444	100.6422	104.4400 (44)
Energy conte	154.8815	135.4604	139.7830	121.8662	116.9335	100.9047	93.5031	107.2961	108.5776	126.5367	138.1247	149.9945 (45)
Energy content (annual)												1493.8621 (45)
Distribution loss (46)m = 0.15 x (45)m	23.2322	20.3191	20.9674	18.2799	17.5400	15.1357	14.0255	16.0944	16.2866	18.9805	20.7187	22.4992 (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	0.6707	0.6072	0.6092	0.5103	0.4696	0.3880	0.3595	0.4309	0.4546	0.5514	0.6191	0.6495 (61)
Total heat required for water heating calculated for each month	155.5522	136.0676	140.3922	122.3765	117.4031	101.2927	93.8626	107.7271	109.0322	127.0882	138.7438	150.6440 (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												1.3563 (H8)
Utilisation factor												0.5216 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												94.9455 (H14)
Volume ratio Veff/V												0.7899 (H15)
Solar storage volume factor												0.9528 (H16)
Solar input												-885.4238 (H17)
Solar input	-28.8925	-41.0884	-71.2989	-95.9091	-111.4529	-121.2284	-114.9430	-104.8169	-82.0399	-56.7031	-34.1733	-22.8775 (63)
Solar input (sum of months) = Sum (63)m =												-885.4238 (63)
Output from w/h	126.6597	94.9792	69.0932	26.4674	5.9503	0.0000	0.0000	2.9102	26.9923	70.3851	104.5706	127.7665 (64)
Total per year (kWh/year) = Sum (64)m =												655.7745 (64)
Heat gains from water heating, kWh/month	51.6658	45.1924	46.6301	40.6481	38.9978	33.6478	31.1797	35.7837	36.2157	42.2113	46.0812	50.0356 (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	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	54.7930	48.6667	39.5784	29.9634	22.3980	18.9093	20.4322	26.5585	35.6468	45.2618	52.8272	56.3159	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	343.8733	347.4417	338.4496	319.3065	295.1419	272.4305	257.2579	253.6895	262.6816	281.8247	305.9893	328.7007	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	(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)	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	(71)
Water heating gains (Table 5)	69.4433	67.2506	62.6749	56.4557	52.4164	46.7331	41.9081	48.0964	50.2996	56.7356	64.0017	67.2521	(72)
Total internal gains	575.1677	570.4169	547.7609	512.7836	477.0143	445.1309	426.6562	435.4025	455.6860	490.8802	529.8763	559.3268	(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					8.5000	25.1733		0.6300	0.7000	0.7700	65.3928 (76)	
West					3.7600	25.1733		0.6300	0.7000	0.7700	28.9267 (80)	
Solar gains	94.3195	156.9547	262.3153	382.0508	438.8355	496.2949	454.2655	408.3994	318.7253	200.7860	117.2204	73.4171 (83)
Total gains	669.4872	727.3716	810.0762	894.8345	915.8498	941.4258	880.9218	843.8019	774.4113	691.6662	647.0967	632.7439 (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	51.1109	51.1109	51.1109	51.1109	51.1109	51.1109	51.1109	51.1109	51.1109	51.1109	51.1109	51.1109
alpha	4.4074	4.4074	4.4074	4.4074	4.4074	4.4074	4.4074	4.4074	4.4074	4.4074	4.4074	4.4074
util living area	0.9786	0.9686	0.9355	0.8500	0.6994	0.4763	0.3349	0.3389	0.6123	0.8691	0.9597	0.9821 (86)
MIT	20.0028	20.1195	20.3891	20.7003	20.9049	20.9862	20.9978	20.9977	20.9600	20.7280	20.3249	19.9690 (87)
Th 2	20.0400	20.0400	20.0400	20.0400	20.0400	20.0400	20.0400	20.0400	20.0400	20.0400	20.0400	20.0400 (88)
util rest of house	0.9731	0.9607	0.9193	0.8145	0.6354	0.3913	0.2384	0.2383	0.5217	0.8276	0.9476	0.9774 (89)
MIT 2	19.1558	19.2696	19.5292	19.8147	19.9827	20.0348	20.0396	20.0396	20.0221	19.8467	19.4722	19.1229 (90)
Living area fraction									fIA = Living area / (4) =			0.2203 (91)
MIT	19.3424	19.4569	19.7186	20.0098	20.1859	20.2444	20.2507	20.2507	20.2288	20.0409	19.6601	19.3093 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3424	19.4569	19.7186	20.0098	20.1859	20.2444	20.2507	20.2507	20.2288	20.0409	19.6601	19.3093 (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	0.9680	0.9547	0.9130	0.8132	0.6458	0.4097	0.2598	0.2606	0.5404	0.8277	0.9417	0.9728	(94)
Useful gains	648.0949	694.4501	739.5782	727.6962	591.4220	385.7487	228.8297	219.8535	418.5046	572.4746	609.3575	615.5443	(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	1235.3016	1209.6350	1089.3414	890.7935	636.9485	390.5175	229.2798	220.2913	434.0564	713.8069	994.1888	1223.3391	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	436.8818	346.2043	260.2238	117.4301	33.8717	0.0000	0.0000	0.0000	0.0000	105.1512	277.0785	452.1993	(98)
Space heating												2029.0407	(98)
Space heating per m2												(98) / (4) =	23.7537 (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 %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2249.4908 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	436.8818	346.2043	260.2238	117.4301	33.8717	0.0000	0.0000	0.0000	0.0000	105.1512	277.0785	452.1993	(98)
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000	(210)
Space heating fuel (main heating system)	484.3479	383.8185	288.4965	130.1885	37.5518	0.0000	0.0000	0.0000	0.0000	116.5756	307.1824	501.3297	(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	126.6597	94.9792	69.0932	26.4674	5.9503	0.0000	0.0000	2.9102	26.9923	70.3851	104.5706	127.7665	(64)
Efficiency of water heater	86.6810	86.8238	86.9065	87.2996	87.8295	76.4000	76.4000	76.4000	76.4000	84.1083	85.9464	86.7481	(216)
(217)m	146.1217	109.3931	79.5030	30.3178	6.7748	0.0000	0.0000	3.8092	35.3302	83.6839	121.6695	147.2845	(219)
Fuel for water heating, kWh/month												763.8878	(219)
Water heating fuel used													
Annual totals kWh/year													
Space heating fuel - main system												2249.4908	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.2380)													
mechanical ventilation fans (SFP = 0.2380)													61.3863 (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													186.3863 (231)
Electricity for lighting (calculated in Appendix L)													387.0649 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.09 * 1030 * 1.00) =										-898.2118		-898.2118	(233)
Total delivered energy for all uses												2688.6180	(238)

10a. Fuel costs - using BEDF prices (551)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2249.4908	7.3800	166.0124	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	763.8878	7.3800	56.3749	(247)
Mechanical ventilation fans	61.3863	28.6600	17.5933	(249)
Pumps and fans for heating	75.0000	28.6600	21.4950	(249)
Pump for solar water heating	50.0000	28.6600	14.3300	(249)
Energy for lighting	387.0649	28.6600	110.9328	(250)
Additional standing charges			107.0000	(251)
Energy saving/generation technologies				
PV Unit	-898.2118	28.6600	-257.4275	(252)
Total energy cost			236.3109	(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	2249.4908	0.2160	485.8900	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	763.8878	0.2160	164.9998	(264)
Space and water heating			650.8898	(265)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Pumps and fans	186.3863	0.5190	96.7345 (267)
Energy for lighting	387.0649	0.5190	200.8867 (268)
Energy saving/generation technologies			
PV Unit	-898.2118	0.5190	-466.1719 (269)
Total kg/year			482.3390 (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	2249.4908	1.2200	2744.3788 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	763.8878	1.2200	931.9431 (264)
Space and water heating			3676.3219 (265)
Pumps and fans	186.3863	3.0700	572.2060 (267)
Energy for lighting	387.0649	3.0700	1188.2891 (268)
Energy saving/generation technologies			
PV Unit	-898.2118	3.0700	-2757.5102 (269)
Primary energy kWh/year			2679.3068 (272)
Primary energy kWh/m2/year			31.3663 (273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0943 Plot 18	Issued on Date	07/08/2024
Assessment Reference	As Built	Prop Type Ref	Type D
Project	8, Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	89 B	DER	12.17	TER	17.89
Environmental	91 B	% DER<TER	31.97		
CO ₂ Emissions (t/year)	0.69	DFEE	43.71	TFEE	50.48
General Requirements Compliance	Pass	% DFEE<TFEE	13.41		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com	Assessor ID	E477-0001
Client	Foreman Homes, FORE		

Building Elements

Roof 000002 - Mineral Wool between and above

Roof Type: Pitched Roof, insulated flat ceiling

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)	Density (kg/m ³)	Heat Cap. (J/kgK)
Ext surface				0.0400			
Layer 1	Mineral wool batt						
	Main construction	350	0.0380	9.2105	100.00		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 2	Mineral wool batt						
	Main construction	100	0.0380	2.6316	87.50		
	Main construction	100	0.1300	0.7692	12.50		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 3	Plasterboard, standard						
	Main construction	12.5	0.2100	0.0595	100.00	700	1000
Int surface				0.1000			

Total resistance: Upper limit = 11.772 m² K/W Lower limit = 11.430 m² K/W Average = 11.601 m² K/W
Total correction = 0.0096 m² K/W U-value (unrounded) = 0.1 W/m² K

Unheated space: None

Total thickness: 463 mm

U-value: 0.10 W/m² K

Kappa: 9.10 kJ/m² K

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0943 Plot 18	Issued on Date	07/08/2024
Assessment Reference	As Built	Prop Type Ref	Type D
Project	8, Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	89 B	DER	12.17	TER	17.89
Environmental	91 B	% DER<TER	31.97		
CO ₂ Emissions (t/year)	0.69	DFEE	43.71	TFEE	50.48
General Requirements Compliance	Pass	% DFEE<TFEE	13.41		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com	Assessor ID	E477-0001
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Client	Foreman Homes, FORE
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Building Elements

Wall 000001

Wall Type: Standard Wall

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

Total resistance:	Upper limit = 4.321 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 0943 Plot 18	Issued on Date	07/08/2024
Assessment Reference	As Built	Prop Type Ref	Type D
Project	8, Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	89 B	DER	12.17	TER	17.89
Environmental	91 B	% DER<TER	31.97		
CO ₂ Emissions (t/year)	0.69	DFEE	43.71	TFEE	50.48
General Requirements Compliance	Pass	% DFEE<TFEE	13.41		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com	Assessor ID	E477-0001
Client	Foreman Homes, FORE		

Building Elements

Floor 000003 - Worst Case Slab

Floor Type: Slab On Ground Floor

Area = 34.96 m², Perimeter = 16.87 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 0943 Plot 18			Issued on Date	07/08/2024
Assessment Reference	As Built	Prop Type Ref	Type D		
Property	8, Shaw Crescent, West End, Southampton, SO30 3LH				
SAP Rating	89 B	DER	12.17	TER	17.89
Environmental	91 B	% DER<TER	31.97		
CO ₂ Emissions (t/year)	0.69	DFEE	43.71	TFEE	50.48
General Requirements Compliance	Pass	% DFEE<TFEE	13.41		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com			Assessor ID	E477-0001
Client	Foreman Homes, FORE				

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

Orientation	West
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Suburban
1.0 Property Type	House, Semi-Detached
2.0 Number of Storeys	2
3.0 Date Built	2023
4.0 Sheltered Sides	2
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements		Heat Loss Perimeter	Internal Floor Area	Average Storey Height
	Ground Floor:	18.47 m	42.71 m ²	2.39 m
	1st Storey:	18.47 m	42.71 m ²	2.56 m

7.0 Living Area	18.82	m ²
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8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	193.63	kJ/m ² K

9.0 External Walls			U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Description	Type	Construction				
Brick and Block	Cavity Wall	Other	0.24	42.22	91.43	77.02

9.1 Party Walls			U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)
Description	Type	Construction			
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	43.61

9.2 Internal Walls			Kappa (kJ/m ² K)	Area (m ²)
Description	Construction			
Ground Floor Block	Dense block, plasterboard on dabs		75.00	23.04
Ground Floor Stud	Plasterboard on timber frame		9.00	45.08
First Floor Stud	Plasterboard on timber frame		9.00	93.69

10.0 External Roofs			U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Description	Type	Construction				
Pitched Roof	External Plane Roof	Other	0.10	9.10	42.71	42.71

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	42.71

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	42.71

11.2 Internal Floors

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	Plasterboard ceiling, carpeted chipboard floor	18.00	42.71

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	West							2.15	
Front Elevation	Window	[1] Brick and Block	West	None	0.00					3.76	
Rear Elevation	Window	[1] Brick and Block	East	None	0.00					8.50	

14.0 Conservatory

15.0 Draught Proofing

 %

16.0 Draught Lobby

17.0 Thermal Bridging

17.1 List of Bridges

Source Type	Bridge Type	Length	Psi	Imported	Reference:
Independently assessed	E2 Other lintels (including other steel lintels)	1.93	0.071	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	4.99	0.064	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	1.59	0.067	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	1.81	0.061	No	Birtley Supatherm
Independently assessed	E3 Sill	7.71	0.021	No	Knauf P5
Independently assessed	E4 Jamb	22.20	0.016	No	Knauf P6
Table K1 - Default	E5 Ground floor (normal)	18.47	0.320	No	
Independently assessed	E6 Intermediate floor within a dwelling	18.47	0.000	No	CD0029
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	9.74	0.060	No	
Independently assessed	E12 Gable (insulation at ceiling level)	8.83	0.044	No	Knauf P21
Independently assessed	E16 Corner (normal)	9.90	0.039	No	Knauf P23
Independently assessed	E25 Staggered party wall between dwellings	9.90	0.055	No	Knauf P27 Halved
Table K1 - Default	P1 Party wall - Ground floor	8.81	0.160	No	
Table K1 - Default	P2 Party wall - Intermediate floor within a dwelling	8.81	0.000	No	
Independently assessed	P4 Party wall - Roof (insulation at ceiling level)	8.81	0.035	No	Knauf P29 Halved

Y-value	0.061	W/m²K
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18.0 Pressure Testing

Designed AP ₅₀	5.00	m³/(h.m²) @ 50 Pa
Property Tested ?	Yes	
As Built AP ₅₀	3.54	m³/(h.m²) @ 50 Pa

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather	Windows half open
Cross ventilation possible	Yes
Night Ventilation	No
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	500107
Configuration	3
Manufacturer SFP	0.17
Duct Type	Rigid
Wet Rooms	3

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	24	
Total number of L.E.L. fittings	24	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted	Yes
Light and motion sensor	Yes

23.0 Electricity Tariff

Standard

24.0 Main Heating 1

Description	Database	
Percentage of Heat	Gas Combi	%
Database Ref. No.	100	
Fuel Type	17960	
Main Heating	Mains gas	
SAP Code	BGW	
In Winter	104	
In Summer	90.2	
Controls	76.4	
PCDF Controls	CBE Programmer, room thermostat and TRVs	
Delayed Start Stat	0	
Sap Code	No	
Flue Type	2106	
	Balanced	

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Fan Assisted Flue	Yes
Is MHS Pumped	Pump in heated space
Heat Emitter	Radiators
Flow Temperature	Normal (> 45°C)
Combi boiler type	Standard Combi
Combi keep hot type	None
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
1.09	East	30°	None Or Little	Yes

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

	Typical Cost	Typical savings per year	Ratings after improvement	
			SAP rating	Environmental Impact
Solar water heating	£4,000 - £6,000	£65	B 90	