



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 10 Shaw Crescent, West End
SOUTHAMPTON, SO30 3LH

Contact: Tobias Whiting
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Report Issue Date: 29/11/2024

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0943 Plot 17	Issued on Date	29/11/2024
Assessment Reference	As Built	Prop Type Ref	Type D
Property	10 Shaw Crescent, West End, SOUTHAMPTON, SO30 3LH		
SAP Rating	89 B	DER	12.17
Environmental	91 B	TER	17.89
CO ₂ Emissions (t/year)	0.69	% DER<TER	31.97
General Requirements Compliance	Pass	DfEE	43.41
		TfEE	50.48
		% DfEE<TfEE	14.01
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)	43.41	kWh/m ² /yr	
	-7.1 (-14.1%)	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	3.11 (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

3.11 (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	3.1	m ³ /m ² h
Photovoltaic array	1.09	kW

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THERMAL BRIDGING

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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	43.41	TFEE	50.48
General Requirements Compliance	Pass	% DFEE<TFEE	14.01		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com			Assessor ID	E477-0001
Client	Foreman Homes, FORE				

	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.071	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	18.43	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	8.83	1.41	
Party wall	P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	0.000	8.83	0.00	
Party wall	P4 Party wall - Roof (insulation at ceiling level)	Independently assessed	0.035	8.83	0.31	Knauf P29 Halved

Total: **10.73** W/mK:
Y-Value: **0.061** W/m²K:

FULL SAP CALCULATION PRINTOUT

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CO ₂ Emissions (t/year)	0.69	DFEE	43.41	TFEE	50.48
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Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com			Assessor ID	E477-0001
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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)43.4 kWh/m²/yrOK

2 Fabric U-values

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

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.11 (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	3.1 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														3.1100
Infiltration rate														0.1555 (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) =				0.1322 (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	0.1685	0.1652	0.1619	0.1454	0.1421	0.1256	0.1256	0.1223	0.1322	0.1421	0.1487	0.1553 (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			43.4700	0.0000	0.0000	110.0000	4781.7000 (32)					
Ground Floor Block			23.1800			75.0000	1738.5000 (32c)					
Ground Floor Stud			45.2200			9.0000	406.9800 (32c)					
First Floor Stud			93.5700			9.0000	842.1300 (32c)					
Internal Floor 1			42.7100			18.0000	768.7800 (32d)					
Internal Ceiling 1			42.2800			18.0000	761.0400 (32e)					
Heat capacity Cm = Sum(A x k)				(28) ... (30) + (32) + (32a) ... (32e) =	16527.2154		(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							193.4818 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.7262 (36)					
Total fabric heat loss				(33) + (36) =			55.0104 (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	89.8938	89.8938	89.8938	89.8938	89.8938	89.8938	89.8938	89.8938	89.8938	89.8938	89.8938	89.8938 (39)
Average = Sum(39)m / 12 =												89.8938 (39)
HLP	Jan 1.0524	Feb 1.0524	Mar 1.0524	Apr 1.0524	May 1.0524	Jun 1.0524	Jul 1.0524	Aug 1.0524	Sep 1.0524	Oct 1.0524	Nov 1.0524	Dec 1.0524 (40)
HLP (average)												1.0524 (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

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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												
Solar input	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 (sum of months) = Sum (63)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 (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	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 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	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	51.0702	51.0702	51.0702	51.0702	51.0702	51.0702	51.0702	51.0702	51.0702	51.0702	51.0702	51.0702
alpha	4.4047	4.4047	4.4047	4.4047	4.4047	4.4047	4.4047	4.4047	4.4047	4.4047	4.4047	4.4047
util living area	0.9962	0.9925	0.9813	0.9455	0.8576	0.7040	0.5444	0.6033	0.8408	0.9697	0.9931	0.9970 (86)
MIT	19.5725	19.7364	20.0311	20.4076	20.7329	20.9208	20.9800	20.9689	20.8193	20.3826	19.8966	19.5268 (87)
Th 2	20.0399	20.0399	20.0399	20.0399	20.0399	20.0399	20.0399	20.0399	20.0399	20.0399	20.0399	20.0399 (88)
util rest of house	0.9952	0.9905	0.9761	0.9297	0.8163	0.6238	0.4351	0.4925	0.7793	0.9579	0.9909	0.9963 (89)
MIT 2	18.7299	18.8930	19.1848	19.5506	19.8487	19.9981	20.0334	20.0287	19.9284	19.5326	19.0533	18.6844 (90)
Living area fraction									fLA = Living area / (4) =			0.2203 (91)
MIT	18.9155	19.0788	19.3712	19.7394	20.0435	20.2014	20.2419	20.2358	20.1247	19.7199	19.2391	18.8700 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9155	19.0788	19.3712	19.7394	20.0435	20.2014	20.2419	20.2358	20.1247	19.7199	19.2391	18.8700 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	456.7709	521.4031	589.3767	639.6382	610.1084	469.0931	321.1468	334.4439	456.1148	475.3425	441.0881	432.6831 (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	1313.8424	1274.5890	1157.0427	974.3936	750.0316	503.5277	327.3874	344.8190	541.5849	819.8218	1091.2315	1318.7399 (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	637.6612	506.1409	422.3435	241.0239	104.1029	0.0000	0.0000	0.0000	0.0000	256.2926	468.1032	659.2262 (98)
Space heating												3294.8945 (98)
Space heating per m2												38.5729 (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													3652.8764 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	637.6612	506.1409	422.3435	241.0239	104.1029	0.0000	0.0000	0.0000	0.0000	256.2926	468.1032	659.2262	(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)	706.9415	561.1318	468.2300	267.2105	115.4134	0.0000	0.0000	0.0000	0.0000	284.1382	518.9615	730.8495	(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	87.1142	86.8752	86.3106	85.0280	82.3190	76.4000	76.4000	76.4000	76.4000	85.1042	86.6227	87.2679	(216)
Fuel for water heating, kWh/month	178.5612	156.6241	162.6593	143.9249	142.6197	132.5821	122.8568	141.0040	142.7123	149.3324	160.1703	172.6225	(219)
Water heating fuel used												1805.6697	(219)
Annual totals kWh/year													
Space heating fuel - main system												3652.8764	(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													5190.3483 (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	3652.8764	0.2160	789.0213	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1805.6697	0.2160	390.0246	(264)
Space and water heating			1179.0459	(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			1039.8513	(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 m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			2.1500	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, m2)			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/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.3319 (36)					
Total fabric heat loss						(33) + (36) =	52.7039 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 41.1760	Feb 40.9316	Mar 40.6921	Apr 39.5672	May 39.3567	Jun 38.3769	Jul 38.3769	Aug 38.1954	Sep 38.7543	Oct 39.3567	Nov 39.7825	Dec 40.2276 (38)
Heat transfer coeff	93.8799	93.6355	93.3960	92.2710	92.0606	91.0808	91.0808	90.8993	91.4582	92.0606	92.4864	92.9315 (39)
Average = Sum(39)m / 12 =												92.2700 (39)
HLP	Jan 1.0990	Feb 1.0962	Mar 1.0934	Apr 1.0802	May 1.0777	Jun 1.0663	Jul 1.0663	Aug 1.0641	Sep 1.0707	Oct 1.0777	Nov 1.0827	Dec 1.0879 (40)
HLP (average)												1.0802 (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)
Daily hot water use	Jan 104.4400	Feb 100.6422	Mar 96.8444	Apr 93.0466	May 89.2488	Jun 85.4509	Jul 85.4509	Aug 89.2488	Sep 93.0466	Oct 96.8444	Nov 100.6422	Dec 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												

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	63.1865	63.3514	63.5139	64.2883	64.4352	65.1284	65.1284	65.2584	64.8596	64.4352	64.1386	63.8314	
alpha	5.2124	5.2234	5.2343	5.2859	5.2957	5.3419	5.3419	5.3506	5.3240	5.2957	5.2759	5.2554	
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	19.7883	19.9290	20.1813	20.5178	20.7984	20.9526	20.9908	20.9845	20.8713	20.4972	20.0831	19.7657	(87)
Th 2	20.0016	20.0040	20.0062	20.0170	20.0191	20.0285	20.0285	20.0302	20.0248	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	18.3789	18.5861	18.9546	19.4432	19.8181	19.9964	20.0250	20.0237	19.9180	19.4223	18.8196	18.3524	(90)
Living area fraction	18.6894	18.8820	19.2249	19.6800	20.0341	20.2070	20.2378	20.2354	20.1280	19.6591	19.0980	18.6638	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6894	18.8820	19.2249	19.6800	20.0341	20.2070	20.2378	20.2354	20.1280	19.6591	19.0980	18.6638	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	475.2540	541.4464	612.8075	669.8349	643.2998	487.7103	328.3759	343.2325	481.3067	499.0906	460.4776	450.8190	(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	1350.8760	1309.2106	1188.4549	994.6785	767.2419	510.6930	331.3324	348.6313	551.3120	833.9902	1109.6511	1344.1413	(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	651.4628	515.9376	428.2816	233.8874	92.2130	0.0000	0.0000	0.0000	0.0000	249.1653	467.4049	664.6318	(98)
Space heating												3302.9843	(98)
Space heating per m2												38.6676	(99)

8c. Space cooling requirement

Not applicable

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

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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													3536.3858 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	651.4628	515.9376	428.2816	233.8874	92.2130	0.0000	0.0000	0.0000	0.0000	249.1653	467.4049	664.6318	(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)	697.4976	552.3957	458.5456	250.4148	98.7291	0.0000	0.0000	0.0000	0.0000	266.7723	500.4336	711.5972	(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	87.7500	87.5349	87.0461	85.8880	83.6861	80.3000	80.3000	80.3000	80.3000	85.9277	87.2585	87.8352	(216)
Fuel for water heating, kWh/month	234.5761	207.3319	217.2800	195.3151	194.0750	178.1381	170.6699	190.2569	192.3581	204.6925	214.8098	228.7847	(219)
Water heating fuel used												2428.2880	(219)
Annual totals kWh/year													
Space heating fuel - main system												3536.3858	(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												6426.7387	(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	3536.3858	0.2160	763.8593 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2428.2880	0.2160	524.5102 (264)
Space and water heating			1288.3696 (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			1528.1812 (272)
Emissions per m2 for space and water heating			15.0828 (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) = (15.0828 * 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					3.1100
Infiltration rate					0.2974 (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)	=	0.2528 (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	0.3223	0.3160	0.3097	0.2781	0.2718	0.2402	0.2402	0.2338	0.2528	0.2718	0.2844	0.2970 (22b)
Effective ac	0.5519	0.5499	0.5479	0.5387	0.5369	0.5288	0.5288	0.5273	0.5320	0.5369	0.5404	0.5441 (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			43.4700	0.0000	0.0000	110.0000	4781.7000 (32)
Ground Floor Block			23.1800			75.0000	1738.5000 (32c)
Ground Floor Stud			45.2200			9.0000	406.9800 (32c)
First Floor Stud			93.5700			9.0000	842.1300 (32c)
Internal Floor 1			42.7100			18.0000	768.7800 (32d)
Internal Ceiling 1			42.2800			9.0000	380.5200 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss
(28)...(30) + (32) + (32a)...(32e) = 16146.6954 (34)
189.0271 (35)
10.7262 (36)
(33) + (36) = 55.0104 (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	38.5072	38.3665	38.2285	37.5807	37.4595	36.8952	36.8952	36.7907	37.1126	37.4595	37.7047	37.9610 (38)
Heat transfer coeff	93.5176	93.3768	93.2389	92.5911	92.4699	91.9056	91.9056	91.8011	92.1229	92.4699	92.7151	92.9714 (39)
Average = Sum(39)m / 12 =												92.5905 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0948	1.0931	1.0915	1.0840	1.0825	1.0759	1.0759	1.0747	1.0785	1.0825	1.0854	1.0884 (40)
HLP (average)												1.0839 (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
Average daily hot water use (litres/day)
2.5577 (42)
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

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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	47.9610	48.0332	48.1043	48.4409	48.5044	48.8022	48.8022	48.8577	48.6870	48.5044	48.3761	48.2427	
alpha	4.1974	4.2022	4.2070	4.2294	4.2336	4.2535	4.2535	4.2572	4.2458	4.2336	4.2251	4.2162	
util living area	0.9967	0.9934	0.9835	0.9512	0.8710	0.7235	0.5653	0.6265	0.8573	0.9738	0.9941	0.9974	(86)
MIT	19.4392	19.6116	19.9225	20.3308	20.6842	20.9018	20.9736	20.9595	20.7839	20.3099	19.7958	19.4040	(87)
Th 2	20.0051	20.0064	20.0078	20.0140	20.0151	20.0205	20.0205	20.0215	20.0185	20.0151	20.0128	20.0103	(88)
util rest of house	0.9959	0.9917	0.9788	0.9367	0.8318	0.6433	0.4518	0.5127	0.7988	0.9635	0.9922	0.9968	(89)
MIT 2	18.5721	18.7448	19.0543	19.4576	19.7860	19.9676	20.0117	20.0065	19.8823	19.4443	18.9340	18.5410	(90)
Living area fraction	18.7631	18.9358	19.2456	19.6500	19.9839	20.1734	20.2236	20.2165	20.0809	19.6350	19.1239	18.7311	(91)
MIT	18.7631	18.9358	19.2456	19.6500	19.9839	20.1734	20.2236	20.2165	20.0809	19.6350	19.1239	18.7311	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7631	18.9358	19.2456	19.6500	19.9839	20.1734	20.2236	20.2165	20.0809	19.6350	19.1239	18.7311	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	429.0676	494.9607	565.9694	622.2930	602.2055	469.6916	324.7401	336.7657	449.2983	455.4069	415.7704	405.6571	(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	1352.5538	1310.6188	1188.3830	995.3523	766.0094	512.2298	333.0284	350.3559	550.9809	835.4640	1114.7950	1350.9784	(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	687.0737	548.1223	463.0757	268.6027	121.8702	0.0000	0.0000	0.0000	0.0000	282.7625	503.2977	703.3191	(98)
Space heating												3578.1239	(98)
Space heating per m2												41.8886	(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	863.9126	680.1014	697.6884	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8391	0.9011	0.8727	0.0000	0.0000	0.0000	0.0000	(101)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	724.9197	612.8132	608.8699	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	149.2299	207.0777	164.2044	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												520.5120 (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	37.3075	51.7694	41.0511	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												130.1280 (107)
Space cooling per m2												1.5234 (108)
Energy for space heating												41.8886 (99)
Energy for space cooling												1.5234 (108)
Total												43.4120 (109)
Dwelling Fabric Energy Efficiency (DFEE)												43.4 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	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																3 * 10 =	30.0000 (7a)
Number of passive vents																0 * 10 =	0.0000 (7b)
Number of flueless gas fires																0 * 40 =	0.0000 (7c)
										Air changes per hour							
Infiltration due to chimneys, flues and fans										= (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000	/ (5) =	0.1419 (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 m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			2.1500	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, m2)			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/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.3319 (36)					
Total fabric heat loss						(33) + (36) =	52.7039 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 41.1760	Feb 40.9316	Mar 40.6921	Apr 39.5672	May 39.3567	Jun 38.3769	Jul 38.3769	Aug 38.1954	Sep 38.7543	Oct 39.3567	Nov 39.7825	Dec 40.2276 (38)
Heat transfer coeff	93.8799	93.6355	93.3960	92.2710	92.0606	91.0808	91.0808	90.8993	91.4582	92.0606	92.4864	92.9315 (39)
Average = Sum(39)m / 12 =												92.2700 (39)
HLP	Jan 1.0990	Feb 1.0962	Mar 1.0934	Apr 1.0802	May 1.0777	Jun 1.0663	Jul 1.0663	Aug 1.0641	Sep 1.0707	Oct 1.0777	Nov 1.0827	Dec 1.0879 (40)
HLP (average)												1.0802 (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)
Daily hot water use	Jan 104.4400	Feb 100.6422	Mar 96.8444	Apr 93.0466	May 89.2488	Jun 85.4509	Jul 85.4509	Aug 89.2488	Sep 93.0466	Oct 96.8444	Nov 100.6422	Dec 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												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Heat gains from water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
	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
West													3.7600	19.6403	0.6300	0.7000	0.7700	22.5687
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	63.1865	63.3514	63.5139	64.2883	64.4352	65.1284	65.1284	65.2584	64.8596	64.4352	64.1386	63.8314	
alpha	5.2124	5.2234	5.2343	5.2859	5.2957	5.3419	5.3419	5.3506	5.3240	5.2957	5.2759	5.2554	
util living area	0.9991	0.9979	0.9932	0.9721	0.9021	0.7456	0.5733	0.6391	0.8879	0.9875	0.9982	0.9994	(86)
MIT	19.7386	19.8806	20.1365	20.4809	20.7750	20.9444	20.9888	20.9808	20.8501	20.4562	20.0357	19.7167	(87)
Th 2	20.0016	20.0040	20.0062	20.0170	20.0191	20.0285	20.0285	20.0302	20.0248	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	0.5179	0.8282	0.9809	0.9974	0.9991	(89)
MIT 2	18.8441	18.9877	19.2442	19.5907	19.8632	20.0022	20.0255	20.0245	19.9372	19.5723	19.1517	18.8295	(90)
Living area fraction	19.0411	19.1844	19.4408	19.7868	20.0641	20.2098	20.2378	20.2352	20.1383	19.7671	19.3465	19.0250	(91)
MIT	19.0411	19.1844	19.4408	19.7868	20.0641	20.2098	20.2378	20.2352	20.1383	19.7671	19.3465	19.0250	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0411	19.1844	19.4408	19.7868	20.0641	20.2098	20.2378	20.2352	20.1383	19.7671	19.3465	19.0250	(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	0.8653	0.6762	0.4808	0.5448	0.8364	0.9785	0.9966	0.9988	(94)
Ext temp.	430.8196	498.5610	574.3660	640.7499	627.4858	483.4574	327.6807	341.7721	467.8838	465.0516	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	1383.8967	1337.5275	1208.6216	1004.5393	770.0031	510.9441	331.3304	348.6165	552.2524	843.9242	1132.6334	1377.7078	(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	709.0893	563.7855	471.8862	261.9283	106.0329	0.0000	0.0000	0.0000	0.0000	281.8812	514.0905	722.2051	(98)
Space heating per m2												3630.8989	(98)
												42.5064	(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	856.1591	673.9976	690.8347	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8758	0.9339	0.9086	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	749.8603	629.4790	627.6868	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	131.2727	194.6783	150.2046	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												476.1557	(104)
Cooled fraction												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	32.8182	48.6696	37.5512	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling											119.0389 (107)
Space cooling per m2											1.3936 (108)
Energy for space heating											42.5064 (99)
Energy for space cooling											1.3936 (108)
Total											43.9000 (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												3.1100
Infiltration rate												0.1555 (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) =	0.1322 (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	0.1553	0.1454	0.1454	0.1322	0.1355	0.1289	0.1289	0.1256	0.1256	0.1355	0.1322	0.1355 (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			43.4700	0.0000	0.0000	110.0000	4781.7000 (32)					
Ground Floor Block			23.1800			75.0000	1738.5000 (32c)					
Ground Floor Stud			45.2200			9.0000	406.9800 (32c)					
First Floor Stud			93.5700			9.0000	842.1300 (32c)					
Internal Floor 1			42.7100			18.0000	768.7800 (32d)					
Internal Ceiling 1			42.2800			18.0000	761.0400 (32e)					
Heat capacity Cm = Sum(A x k)					(28) ... (30) + (32) + (32a) ... (32e) =		16527.2154 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							193.4818 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.7262 (36)					
Total fabric heat loss						(33) + (36) =	55.0104 (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	89.8938	89.8938	89.8938	89.8938	89.8938	89.8938	89.8938	89.8938	89.8938	89.8938	89.8938	89.8938 (39)
Average = Sum(39)m / 12 =												89.8938 (39)
HLP	Jan 1.0524	Feb 1.0524	Mar 1.0524	Apr 1.0524	May 1.0524	Jun 1.0524	Jul 1.0524	Aug 1.0524	Sep 1.0524	Oct 1.0524	Nov 1.0524	Dec 1.0524 (40)
HLP (average)												1.0524 (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)												
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												
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)
												1500 (64)
												1500 (64)

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	Solar flux	g	FF	Access	Gains						
	m2	Table 6a	W/m2	Specific data	factor	W						
				or Table 6b	or Table 6c							
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	51.0702	51.0702	51.0702	51.0702	51.0702	51.0702	51.0702	51.0702	51.0702	51.0702	51.0702	51.0702
Feb	4.4047	4.4047	4.4047	4.4047	4.4047	4.4047	4.4047	4.4047	4.4047	4.4047	4.4047	4.4047
Mar	0.9785	0.9685	0.9354	0.8500	0.6994	0.4763	0.3349	0.3389	0.6122	0.8690	0.9596	0.9821 (86)
Apr	20.0021	20.1189	20.3886	20.7000	20.9047	20.9862	20.9978	20.9977	20.9599	20.7277	20.3244	19.9683 (87)
May	20.0399	20.0399	20.0399	20.0399	20.0399	20.0399	20.0399	20.0399	20.0399	20.0399	20.0399	20.0399 (88)
Jun	0.9730	0.9606	0.9193	0.8144	0.6354	0.3913	0.2384	0.2383	0.5217	0.8275	0.9475	0.9774 (89)
Jul	19.1551	19.2690	19.5287	19.8144	19.9826	20.0347	20.0395	20.0395	20.0220	19.8465	19.4717	19.1222 (90)
Aug	19.3417	19.4563	19.7181	20.0095	20.1857	20.2443	20.2506	20.2506	20.2287	20.0406	19.6596	19.3086 (92)
Sep												0.0000
Oct												19.3086 (93)
Nov												
Dec												
Living area fraction												
MIT												
Temperature adjustment												
adjusted MIT												

8. Space heating requirement

Utilisation	0.9680	0.9547	0.9129	0.8131	0.6457	0.4097	0.2598	0.2606	0.5404	0.8276	0.9416	0.9728 (94)
Useful gains	648.0576	694.4013	739.5080	727.6177	591.3799	385.7489	228.8350	219.8584	418.4887	572.4123	609.3087	615.5123 (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	1235.2961	1209.6331	1089.3458	890.8042	636.9627	390.5299	229.2868	220.2979	434.0679	713.8142	994.1890	1223.3321 (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	436.9055	346.2358	260.2793	117.4943	33.9136	0.0000	0.0000	0.0000	0.0000	105.2030	277.1138	452.2179 (98)
Space heating												2029.3632 (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					3.1100
Infiltration rate					0.1555 (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) =		0.1322 (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	0.1685	0.1652	0.1619	0.1454	0.1421	0.1256	0.1256	0.1223	0.1322	0.1421	0.1487	0.1553 (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			43.4700	0.0000	0.0000	110.0000	4781.7000 (32)					
Ground Floor Block			23.1800			75.0000	1738.5000 (32c)					
Ground Floor Stud			45.2200			9.0000	406.9800 (32c)					
First Floor Stud			93.5700			9.0000	842.1300 (32c)					
Internal Floor 1			42.7100			18.0000	768.7800 (32d)					
Internal Ceiling 1			42.2800			18.0000	761.0400 (32e)					
Heat capacity Cm = Sum(A x k)				(28) ... (30) + (32) + (32a) ... (32e) =	16527.2154		(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K					193.4818		(35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.7262 (36)					
Total fabric heat loss				(33) + (36) =	55.0104		(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 =	89.8938	89.8938	89.8938	89.8938	89.8938	89.8938	89.8938	89.8938	89.8938	89.8938	89.8938	89.8938 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0524	1.0524	1.0524	1.0524	1.0524	1.0524	1.0524	1.0524	1.0524	1.0524	1.0524	1.0524 (40)
HLP (average)												1.0524 (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)
Solar input (sum of months) = Sum (63)m =												
Total per year (kWh/year) = Sum (64)m =												

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	51.0702	51.0702	51.0702	51.0702	51.0702	51.0702	51.0702	51.0702	51.0702	51.0702	51.0702	51.0702
util living area	4.4047	4.4047	4.4047	4.4047	4.4047	4.4047	4.4047	4.4047	4.4047	4.4047	4.4047	4.4047
	0.9857	0.9769	0.9545	0.8970	0.7834	0.6157	0.4619	0.5085	0.7423	0.9246	0.9762	0.9882 (86)
MIT	19.8209	19.9745	20.2415	20.5654	20.8216	20.9532	20.9894	20.9839	20.8942	20.5579	20.1206	19.7717 (87)
Th 2	20.0399	20.0399	20.0399	20.0399	20.0399	20.0399	20.0399	20.0399	20.0399	20.0399	20.0399	20.0399 (88)
util rest of house	0.9823	0.9713	0.9433	0.8718	0.7335	0.5369	0.3654	0.4091	0.6697	0.9004	0.9695	0.9854 (89)
MIT 2	18.9758	19.1271	19.3875	19.6938	19.9181	20.0165	20.0366	20.0345	19.9796	19.6940	19.2729	18.9273 (90)
Living area fraction	19.1620	19.3138	19.5756	19.8858	20.1172	20.2229	20.2465	20.2437	20.1811	19.8843	19.4597	19.1133 (92)
MIT	19.1620	19.3138	19.5756	19.8858	20.1172	20.2229	20.2465	20.2437	20.1811	19.8843	19.4597	19.1133 (93)
Temperature adjustment												0.0000
adjusted MIT	19.1620	19.3138	19.5756	19.8858	20.1172	20.2229	20.2465	20.2437	20.1811	19.8843	19.4597	19.1133 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9782	0.9661	0.9368	0.8671	0.7378	0.5526	0.3866	0.4308	0.6813	0.8958	0.9643	0.9817 (94)
Ext temp.	634.6187	690.1273	735.2215	744.4817	664.6074	485.6849	324.6090	340.3752	498.3384	592.7196	599.4580	608.5215 (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	1336.0012	1295.7125	1175.4161	987.5577	756.6499	505.4612	327.8016	345.5213	546.6512	834.6052	1111.0576	1340.6131 (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	521.8286	406.9533	327.5048	175.0147	68.4797	0.0000	0.0000	0.0000	0.0000	179.9629	368.3517	544.6761 (98)
Space heating per m2												2592.7718 (98)
(98) / (4) =												

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												2874.4698	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	521.8286	406.9533	327.5048	175.0147	68.4797	0.0000	0.0000	0.0000	0.0000	179.9629	368.3517	544.6761	(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)	578.5239	451.1677	363.0873	194.0296	75.9198	0.0000	0.0000	0.0000	0.0000	199.5154	408.3722	603.8538	(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	86.6076	86.2942	85.5627	83.9594	80.9633	76.4000	76.4000	76.4000	76.4000	83.9256	85.9522	86.8031	(216)
(217)m	86.6076	86.2942	85.5627	83.9594	80.9633	76.4000	76.4000	76.4000	76.4000	83.9256	85.9522	86.8031	(217)
Fuel for water heating, kWh/month	179.6058	157.6786	164.0810	145.7567	145.0078	132.5821	122.8568	141.0040	142.7123	151.4296	161.4198	173.5469	(219)
Water heating fuel used												1817.6815	(219)
Annual totals kWh/year													
Space heating fuel - main system												2874.4698	(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												4423.9536	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2874.4698	3.4800	100.0315 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1817.6815	3.4800	63.2553 (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			247.9116 (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] =	0.7984 (257)
SAP value	88.8628	
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	2874.4698	0.2160	620.8855 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1817.6815	0.2160	392.6192 (264)
Space and water heating			1013.5047 (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			874.3101 (272)
CO2 emissions per m2			10.2400 (273)
EI value			91.0169
EI rating			91 (274)
EI band			B

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Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9020 = 3.858$, 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	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												3.1100
Infiltration rate												0.1555 (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) =	0.1322 (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	0.1553	0.1454	0.1454	0.1322	0.1355	0.1289	0.1289	0.1256	0.1256	0.1355	0.1322	0.1355 (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			43.4700	0.0000	0.0000	110.0000	4781.7000 (32)					
Ground Floor Block			23.1800			75.0000	1738.5000 (32c)					
Ground Floor Stud			45.2200			9.0000	406.9800 (32c)					
First Floor Stud			93.5700			9.0000	842.1300 (32c)					
Internal Floor 1			42.7100			18.0000	768.7800 (32d)					
Internal Ceiling 1			42.2800			18.0000	761.0400 (32e)					
Heat capacity Cm = Sum(A x k)				(28) ... (30) + (32) + (32a) ... (32e) =	16527.2154		(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							193.4818 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.7262 (36)					
Total fabric heat loss				(33) + (36) =			55.0104 (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	89.8938	89.8938	89.8938	89.8938	89.8938	89.8938	89.8938	89.8938	89.8938	89.8938	89.8938	89.8938 (39)
Average = Sum(39)m / 12 =												89.8938 (39)
HLP	Jan 1.0524	Feb 1.0524	Mar 1.0524	Apr 1.0524	May 1.0524	Jun 1.0524	Jul 1.0524	Aug 1.0524	Sep 1.0524	Oct 1.0524	Nov 1.0524	Dec 1.0524 (40)
HLP (average)												1.0524 (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

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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												
Solar input	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)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	51.0702	51.0702	51.0702	51.0702	51.0702	51.0702	51.0702	51.0702	51.0702	51.0702	51.0702	51.0702
util living area	4.4047	4.4047	4.4047	4.4047	4.4047	4.4047	4.4047	4.4047	4.4047	4.4047	4.4047	4.4047
	0.9785	0.9685	0.9354	0.8500	0.6994	0.4763	0.3349	0.3389	0.6122	0.8690	0.9596	0.9821 (86)
MIT	20.0021	20.1189	20.3886	20.7000	20.9047	20.9862	20.9978	20.9977	20.9599	20.7277	20.3244	19.9683 (87)
Th 2	20.0399	20.0399	20.0399	20.0399	20.0399	20.0399	20.0399	20.0399	20.0399	20.0399	20.0399	20.0399 (88)
util rest of house	0.9730	0.9606	0.9193	0.8144	0.6354	0.3913	0.2384	0.2383	0.5217	0.8275	0.9475	0.9774 (89)
MIT 2	19.1551	19.2690	19.5287	19.8144	19.9826	20.0347	20.0395	20.0395	20.0220	19.8465	19.4717	19.1222 (90)
Living area fraction	19.3417	19.4563	19.7181	20.0095	20.1857	20.2443	20.2506	20.2506	fLA = Living area / (4) =	20.0406	19.6596	0.2203 (91)
MIT	19.3417	19.4563	19.7181	20.0095	20.1857	20.2443	20.2506	20.2506	20.2287	20.0406	19.6596	19.3086 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3417	19.4563	19.7181	20.0095	20.1857	20.2443	20.2506	20.2506	20.2287	20.0406	19.6596	19.3086 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9680	0.9547	0.9129	0.8131	0.6457	0.4097	0.2598	0.2606	0.5404	0.8276	0.9416	0.9728 (94)
Ext temp.	648.0576	694.4013	739.5080	727.6177	591.3799	385.7489	228.8350	219.8584	418.4887	572.4123	609.3087	615.5123 (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	1235.2961	1209.6331	1089.3458	890.8042	636.9627	390.5299	229.2868	220.2979	434.0679	713.8142	994.1890	1223.3321 (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	436.9055	346.2358	260.2793	117.4943	33.9136	0.0000	0.0000	0.0000	0.0000	105.2030	277.1138	452.2179 (98)
Space heating per m2												2029.3632 (98)
										(98) / (4) =		23.7575 (99)

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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													2249.8484	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	436.9055	346.2358	260.2793	117.4943	33.9136	0.0000	0.0000	0.0000	0.0000	105.2030	277.1138	452.2179	(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)	484.3741	383.8534	288.5580	130.2598	37.5982	0.0000	0.0000	0.0000	0.0000	116.6330	307.2215	501.3503	(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	86.1160	85.8264	84.8310	82.5892	79.1127	76.4000	76.4000	76.4000	76.4000	82.0878	85.0732	86.3046	(216)	
Fuel for water heating, kWh/month	180.6311	158.5382	165.4963	148.1749	148.3998	132.5821	122.8568	141.0040	142.7123	154.8197	163.0876	174.5493	(219)	
Water heating fuel used												1832.8522	(219)	
Annual totals kWh/year														
Space heating fuel - main system													2249.8484	(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													3707.9400	(238)

10a. Fuel costs - using BEDF prices (554)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2249.8484	5.9600	134.0910	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1832.8522	5.9600	109.2380	(247)
Mechanical ventilation fans	61.3863	25.0500	15.3773	(249)
Pumps and fans for heating	75.0000	25.0500	18.7875	(249)
Energy for lighting	387.0649	25.0500	96.9597	(250)
Additional standing charges			112.0000	(251)
Energy saving/generation technologies				
PV Unit	-898.2118	25.0500	-225.0021	(252)
Total energy cost			261.4514	(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	2249.8484	0.2160	485.9673	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1832.8522	0.2160	395.8961	(264)
Space and water heating			881.8633	(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			687.3626	(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	2249.8484	1.2200	2744.8150	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1832.8522	1.2200	2236.0797	(264)
Space and water heating			4980.8947	(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			3830.3796 (272)
Primary energy kWh/m2/year			44.8417 (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	-£ 51	-205 kg (29.8%)

Recommended measures	Typical annual savings		Energy efficiency	Environmental impact
Solar water heating	£51	2.40 kg/m²	B 90	A 93
Total Savings	£51	2.40 kg/m²		

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

Fuel prices for cost data on this page from database revision number 554 TEST (31 Oct 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	£131	£144	-£13
Mains gas	£355	£292	£64
Space heating	£280	£280	£0
Water heating	£109	£58	£51
Lighting	£97	£97	£0
Generated (PV)	-£225	-£225	£0
Total cost of fuels	£261	£211	£51
Total cost of uses	£261	£210	£51
Delivered energy	43 kWh/m²	31 kWh/m²	12 kWh/m²
Carbon dioxide emissions	0.7 tonnes	0.5 tonnes	0.2 tonnes
CO2 emissions per m²	8 kg/m²	6 kg/m²	2 kg/m²
Primary energy	45 kWh/m²	31 kWh/m²	13 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	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														3.1100
Infiltration rate														0.1555 (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) =				0.1322 (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	0.1685	0.1652	0.1619	0.1454	0.1421	0.1256	0.1256	0.1223	0.1322	0.1421	0.1487	0.1553 (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			43.4700	0.0000	0.0000	110.0000	4781.7000 (32)					
Ground Floor Block			23.1800			75.0000	1738.5000 (32c)					
Ground Floor Stud			45.2200			9.0000	406.9800 (32c)					
First Floor Stud			93.5700			9.0000	842.1300 (32c)					
Internal Floor 1			42.7100			18.0000	768.7800 (32d)					
Internal Ceiling 1			42.2800			18.0000	761.0400 (32e)					
Heat capacity Cm = Sum(A x k)				(28) ... (30) + (32) + (32a) ... (32e) =	16527.2154		(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							193.4818 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.7262 (36)					
Total fabric heat loss				(33) + (36) =			55.0104 (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	89.8938	89.8938	89.8938	89.8938	89.8938	89.8938	89.8938	89.8938	89.8938	89.8938	89.8938	89.8938 (39)
Average = Sum(39)m / 12 =												89.8938 (39)
HLP	Jan 1.0524	Feb 1.0524	Mar 1.0524	Apr 1.0524	May 1.0524	Jun 1.0524	Jul 1.0524	Aug 1.0524	Sep 1.0524	Oct 1.0524	Nov 1.0524	Dec 1.0524 (40)
HLP (average)												1.0524 (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	Solar flux	g	FF	Access	Gains						
	m2	Table 6a	W/m2	Specific data	factor	W						
				or Table 6b	or Table 6c							
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)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	51.0702	51.0702	51.0702	51.0702	51.0702	51.0702	51.0702	51.0702	51.0702	51.0702	51.0702	51.0702
alpha	4.4047	4.4047	4.4047	4.4047	4.4047	4.4047	4.4047	4.4047	4.4047	4.4047	4.4047	4.4047
util living area												
	0.9857	0.9769	0.9545	0.8970	0.7834	0.6157	0.4619	0.5085	0.7423	0.9246	0.9762	0.9882 (86)
MIT	19.8209	19.9745	20.2415	20.5654	20.8216	20.9532	20.9894	20.9839	20.8942	20.5579	20.1206	19.7717 (87)
Th 2	20.0399	20.0399	20.0399	20.0399	20.0399	20.0399	20.0399	20.0399	20.0399	20.0399	20.0399	20.0399 (88)
util rest of house												
	0.9823	0.9713	0.9433	0.8718	0.7335	0.5369	0.3654	0.4091	0.6697	0.9004	0.9695	0.9854 (89)
MIT 2	18.9758	19.1271	19.3875	19.6938	19.9181	20.0165	20.0366	20.0345	19.9796	19.6940	19.2729	18.9273 (90)
Living area fraction												
	19.1620	19.3138	19.5756	19.8858	20.1172	20.2229	20.2465	20.2437	20.1811	19.8843	19.4597	19.1133 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1620	19.3138	19.5756	19.8858	20.1172	20.2229	20.2465	20.2437	20.1811	19.8843	19.4597	19.1133 (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	0.9782	0.9661	0.9368	0.8671	0.7378	0.5526	0.3866	0.4308	0.6813	0.8958	0.9643	0.9817	(94)
Useful gains	634.6187	690.1273	735.2215	744.4817	664.6074	485.6849	324.6090	340.3752	498.3384	592.7196	599.4580	608.5215	(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													
	1336.0012	1295.7125	1175.4161	987.5577	756.6499	505.4612	327.8016	345.5213	546.6512	834.6052	1111.0576	1340.6131	(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													
	521.8286	406.9533	327.5048	175.0147	68.4797	0.0000	0.0000	0.0000	0.0000	179.9629	368.3517	544.6761	(98)
Space heating													
Space heating per m2												2592.7718	(98)
										(98) / (4) =		30.3532	(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													2874.4698 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	521.8286	406.9533	327.5048	175.0147	68.4797	0.0000	0.0000	0.0000	0.0000	179.9629	368.3517	544.6761	(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)	578.5239	451.1677	363.0873	194.0296	75.9198	0.0000	0.0000	0.0000	0.0000	199.5154	408.3722	603.8538	(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	87.2232	87.4156	87.9948	89.9549	76.4000	76.4000	76.4000	76.4000	85.6761	86.6170	87.1671	(216)
(217)m	87.0482	87.2232	87.4156	87.9948	89.9549	76.4000	76.4000	76.4000	76.4000	85.6761	86.6170	87.1671	(217)
Fuel for water heating, kWh/month	150.2902	108.6923	80.2112	32.0406	1.1658	0.0000	0.0000	11.9116	41.6071	86.7679	126.3190	149.0832	(219)
Water heating fuel used													
Annual totals kWh/year													
Space heating fuel - main system													2874.4698 (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			-791.6489 (233)
Total delivered energy for all uses													3444.3608 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2874.4698	3.4800	100.0315 (240)	
Space heating - secondary	0.0000	0.0000	0.0000 (242)	
Water heating (other fuel)	788.0887	3.4800	27.4255 (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			218.6768 (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] =	0.7042 (257)
SAP value			90.1761
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	2874.4698	0.2160	620.8855 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	788.0887	0.2160	170.2272 (264)
Space and water heating			791.1126 (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			677.8680 (272)
CO2 emissions per m2			7.9400 (273)
EI value			93.0352
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												3.1100
Infiltration rate												0.1555 (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) =	0.1322 (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	0.1553	0.1454	0.1454	0.1322	0.1355	0.1289	0.1289	0.1256	0.1256	0.1355	0.1322	0.1355 (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			43.4700	0.0000	0.0000	110.0000	4781.7000 (32)					
Ground Floor Block			23.1800			75.0000	1738.5000 (32c)					
Ground Floor Stud			45.2200			9.0000	406.9800 (32c)					
First Floor Stud			93.5700			9.0000	842.1300 (32c)					
Internal Floor 1			42.7100			18.0000	768.7800 (32d)					
Internal Ceiling 1			42.2800			18.0000	761.0400 (32e)					
Heat capacity Cm = Sum(A x k)				(28) ... (30) + (32) + (32a) ... (32e) =	16527.2154		(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							193.4818 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.7262 (36)					
Total fabric heat loss				(33) + (36) =			55.0104 (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	89.8938	89.8938	89.8938	89.8938	89.8938	89.8938	89.8938	89.8938	89.8938	89.8938	89.8938	89.8938 (39)
Average = Sum(39)m / 12 =												89.8938 (39)
HLP	Jan 1.0524	Feb 1.0524	Mar 1.0524	Apr 1.0524	May 1.0524	Jun 1.0524	Jul 1.0524	Aug 1.0524	Sep 1.0524	Oct 1.0524	Nov 1.0524	Dec 1.0524 (40)
HLP (average)												1.0524 (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)										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)
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	51.0702	51.0702	51.0702	51.0702	51.0702	51.0702	51.0702	51.0702	51.0702	51.0702	51.0702	51.0702	
alpha	4.4047	4.4047	4.4047	4.4047	4.4047	4.4047	4.4047	4.4047	4.4047	4.4047	4.4047	4.4047	
util living area	0.9785	0.9685	0.9354	0.8500	0.6994	0.4763	0.3349	0.3389	0.6122	0.8690	0.9596	0.9821	(86)
MIT	20.0021	20.1189	20.3886	20.7000	20.9047	20.9862	20.9978	20.9977	20.9599	20.7277	20.3244	19.9683	(87)
Th 2	20.0399	20.0399	20.0399	20.0399	20.0399	20.0399	20.0399	20.0399	20.0399	20.0399	20.0399	20.0399	(88)
util rest of house	0.9730	0.9606	0.9193	0.8144	0.6354	0.3913	0.2384	0.2383	0.5217	0.8275	0.9475	0.9774	(89)
MIT 2	19.1551	19.2690	19.5287	19.8144	19.9826	20.0347	20.0395	20.0395	20.0220	19.8465	19.4717	19.1222	(90)
Living area fraction									fLA = Living area / (4) =			0.2203	(91)
MIT	19.3417	19.4563	19.7181	20.0095	20.1857	20.2443	20.2506	20.2506	20.2287	20.0406	19.6596	19.3086	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3417	19.4563	19.7181	20.0095	20.1857	20.2443	20.2506	20.2506	20.2287	20.0406	19.6596	19.3086	(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	0.9129	0.8131	0.6457	0.4097	0.2598	0.2606	0.5404	0.8276	0.9416	0.9728	(94)
Useful gains	648.0576	694.4013	739.5080	727.6177	591.3799	385.7489	228.8350	219.8584	418.4887	572.4123	609.3087	615.5123	(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	1235.2961	1209.6331	1089.3458	890.8042	636.9627	390.5299	229.2868	220.2979	434.0679	713.8142	994.1890	1223.3321	(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	436.9055	346.2358	260.2793	117.4943	33.9136	0.0000	0.0000	0.0000	0.0000	105.2030	277.1138	452.2179	(98)
Space heating												2029.3632	(98)
Space heating per m2											(98) / (4) =	23.7575	(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													2249.8484	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	436.9055	346.2358	260.2793	117.4943	33.9136	0.0000	0.0000	0.0000	0.0000	105.2030	277.1138	452.2179	(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)	484.3741	383.8534	288.5580	130.2598	37.5982	0.0000	0.0000	0.0000	0.0000	116.6330	307.2215	501.3503	(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	86.6811	86.8240	86.9070	87.3009	87.8319	76.4000	76.4000	76.4000	76.4000	84.1100	85.9468	86.7482	(216)	
(217)m	86.6811	86.8240	86.9070	87.3009	87.8319	76.4000	76.4000	76.4000	76.4000	84.1100	85.9468	86.7482	(217)	
Fuel for water heating, kWh/month	146.1215	109.3928	79.5025	30.3174	6.7746	0.0000	0.0000	3.8092	35.3302	83.6822	121.6690	147.2843	(219)	
Water heating fuel used												763.8838	(219)	
Annual totals kWh/year														
Space heating fuel - main system												2249.8484	(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													2688.9715	(238)

10a. Fuel costs - using BEDF prices (554)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2249.8484	5.9600	134.0910	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	763.8838	5.9600	45.5275	(247)
Mechanical ventilation fans	61.3863	25.0500	15.3773	(249)
Pumps and fans for heating	75.0000	25.0500	18.7875	(249)
Pump for solar water heating	50.0000	25.0500	12.5250	(249)
Energy for lighting	387.0649	25.0500	96.9597	(250)
Additional standing charges			112.0000	(251)
Energy saving/generation technologies				
PV Unit	-898.2118	25.0500	-225.0021	(252)
Total energy cost			210.2659	(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	2249.8484	0.2160	485.9673	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	763.8838	0.2160	164.9989	(264)
Space and water heating			650.9661	(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			482.4154 (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	2249.8484	1.2200	2744.8150 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	763.8838	1.2200	931.9382 (264)
Space and water heating			3676.7532 (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			2679.7381 (272)
Primary energy kWh/m2/year			31.3713 (273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0943 Plot 17	Issued on Date	29/11/2024
Assessment Reference	As Built	Prop Type Ref	Type D
Project	10 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	43.41	TFEE	50.48
General Requirements Compliance	Pass	% DFEE<TFEE	14.01		

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 17	Issued on Date	29/11/2024
Assessment Reference	As Built	Prop Type Ref	Type D
Project	10 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	43.41	TFEE	50.48
General Requirements Compliance	Pass	% DFEE<TFEE	14.01		

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 17	Issued on Date	29/11/2024
Assessment Reference	As Built	Prop Type Ref	Type D
Project	10 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	43.41	TFEE	50.48
General Requirements Compliance	Pass	% DFEE<TFEE	14.01		

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 17			Issued on Date	29/11/2024
Assessment Reference	As Built	Prop Type Ref	Type D		
Property	10 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	43.41	TFEE	50.48
General Requirements Compliance	Pass	% DFEE<TFEE	14.01		
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	193.48	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	43.47

9.2 Internal Walls			Kappa (kJ/m ² K)	Area (m ²)
Description	Construction			
Ground Floor Block	Dense block, plasterboard on dabs		75.00	23.18
Ground Floor Stud	Plasterboard on timber frame		9.00	45.22
First Floor Stud	Plasterboard on timber frame		9.00	93.57

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	42.28

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

None

15.0 Draught Proofing

100 %

16.0 Draught Lobby

No

17.0 Thermal Bridging

Calculate Bridges

17.1 List of Bridges

Source Type	Bridge Type	Length	Psi	Imported	Reference:
Independently assessed	E2 Other lintels (including other steel lintels)	1.93	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	18.43	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	8.83	0.160	No	
Table K1 - Default	P2 Party wall - Intermediate floor within a dwelling	8.83	0.000	No	
Independently assessed	P4 Party wall - Roof (insulation at ceiling level)	8.83	0.035	No	Knauf P29 Halved

Y-value 0.061 W/m²K

18.0 Pressure Testing

Designed AP ₅₀	Yes	
Property Tested ?	5.00	m³/(h.m²) @ 50 Pa
As Built AP ₅₀	Yes	
	3.11	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
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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	£51	B 90	