



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 20, Shaw Crescent
West End, Southampton, SO30 3LH

Contact: Tobias Whiting
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Report Issue Date: 24/05/2024

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0943 plot 23			Issued on Date	24/05/2024
Assessment Reference	As Built	Prop Type Ref	Block J		
Property	20, Shaw Crescent, West End, Southampton, SO30 3LH				
SAP Rating	87 B	DER	14.24	TER	19.01
Environmental	90 B	% DER<TER	25.11		
CO ₂ Emissions (t/year)	0.70	DFEE	40.97	TFEE	49.58
General Requirements Compliance	Pass	% DFEE<TFEE	17.38		
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)	19.01	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.24	kgCO ₂ /m ²	Pass
	-4.77 (-25.1%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	49.58	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	40.97	kWh/m ² /yr	
	-8.6 (-17.3%)	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)	0.25 (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	1.18 (max. 2.00)	1.20 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.76 (measured in this dwelling)	m ³ /(h.m ²) @ 50 Pa	
Maximum	10.0	m ³ /(h.m ²) @ 50 Pa	Pass

Limiting System Efficiencies

4 Heating efficiency

This report has been produced by an accredited Elmhurst member whose work is subject to quality assurance audits. The data used to produce the report has been verified by the Elmhurst members' portal.

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Main heating system

Boiler system with radiators or underfloor - Mains gas
Data from database
Vaillant ecoFIT sustain 830 VUW 306/6-3 (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 North

3.34 m², No overhang

Windows facing East

2.17 m², No overhang

Windows facing West

3.00 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

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

4.76 (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
Party wall U-value	0.00	W/m ² K
Roof U-value	0.10	W/m ² K
Floor U-value	0.12	W/m ² K
Door U-value	1.10	W/m ² K
Photovoltaic array	0.80	kW

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THERMAL BRIDGING

Calculation Type: New Build (As Built)

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SAP Rating	87 B	DER	14.24
Environmental	90 B	TER	19.01
CO ₂ Emissions (t/year)	0.70	% DER<TER	25.11
General Requirements Compliance	Pass	DFEE	40.97
		TFEE	49.58
		% DFEE<TFEE	17.38
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	0.077	0.69	0.05	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.071	1.02	0.07	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	0.061	1.81	0.11	Birtley Supatherm
External wall	E3 Sill	Independently assessed	0.021	7.49	0.16	Knauf P5
External wall	E4 Jamb	Independently assessed	0.016	17.70	0.28	Knauf P6
External wall	E5 Ground floor (normal)	Table K1 - Default	0.320	2.23	0.71	
External wall	E7 Party floor between dwellings (in blocks of flats)	Table K1 - Approved	0.070	22.03	1.54	
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	12.77	0.77	
External wall	E12 Gable (insulation at ceiling level)	Independently assessed	0.044	11.80	0.52	Knauf P21
External wall	E16 Corner (normal)	Independently assessed	0.039	9.29	0.36	Knauf P23
External wall	E16 Corner (normal)	Independently assessed	0.048	2.82	0.14	Knauf P23
External wall	E18 Party wall between dwellings	Independently assessed	0.026	2.40	0.06	Knauf P25/3
External wall	E18 Party wall between dwellings	Independently assessed	0.040	2.40	0.10	Knauf P25 Halved
External wall	E25 Staggered party wall between dwellings	Independently assessed	0.062	7.54	0.47	Knauf P27 Halved
Party wall	P1 Party wall - Ground floor	Table K1 - Default	0.160	7.54	1.21	
Party wall	P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	0.000	13.66	0.00	
Party wall	P4 Party wall - Roof (insulation at ceiling level)	Independently assessed	0.035	8.78	0.31	Knauf P29 Halved

Total: **7.17** W/mK:
Y-Value: **0.055** W/m²K:

FULL SAP CALCULATION PRINTOUT

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

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

DWELLING AS BUILT

Semi-Detached Maisonette, total floor area 67 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas

Fuel factor:1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 19.01 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 14.24 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)49.6 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)41.0 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.25 (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	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 4.76 (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 830 VUW 306/6-3 (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 North: 3.34 m², No overhang

Windows facing East: 2.17 m², No overhang

Windows facing West: 3.00 m², No overhang

Air change rate: 4.00 ach

Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K

Party wall U-value 0.00 W/m²K

Roof U-value 0.10 W/m²K

Floor U-value 0.12 W/m²K

Door U-value 1.10 W/m²K

Photovoltaic array 0.80 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	4.0100 (1b)	x 2.8300 (2b)	= 11.3483 (1b) - (3b)
First floor	63.3400 (1c)	x 2.3200 (2c)	= 146.9488 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	67.3500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 158.2971 (5)

2. Ventilation rate

					main heating	secondary heating	other		total	m3 per hour		
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans											0 * 10 =	0.0000 (7a)
Number of passive vents											0 * 10 =	0.0000 (7b)
Number of flueless gas fires											0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =											0.0000 / (5) =	0.0000 (8)
Pressure test											Yes	
Measured/design AP50												4.7600
Infiltration rate												0.2380 (18)
Number of sides sheltered												1 (19)
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.2202 (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												
	0.2807	0.2752	0.2697	0.2422	0.2367	0.2091	0.2091	0.2036	0.2202	0.2367	0.2477	0.2587 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5307	0.5252	0.5197	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5087 (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)			8.5100	1.1450	9.7443		(27)					
Ground Floor			3.9000	0.1200	0.4680	84.0000	327.6000 (28a)					
Brick and Block	6.3000	2.1500	4.1500	0.2500	1.0375	68.2600	283.2790 (29a)					
First Floor	57.2600	8.5100	48.7500	0.2400	11.7000	42.2200	2058.2250 (29a)					
Pitched Roof	63.3400		63.3400	0.1000	6.3340	9.1000	576.3940 (30)					
Total net area of external elements Aum(A, m2)			130.8000				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		31.6488		(33)					
Party Wall 1			21.2600	0.0000	0.0000	58.0600	1234.3556 (32)					
Party Wall 2			20.3500	0.0000	0.0000	58.0600	1181.5210 (32)					
Party Floor 1			59.7400			70.0000	4181.8000 (32d)					
Stud partition			128.4600			9.0000	1156.1400 (32c)					
Internal Floor 1			4.0000			70.0000	280.0000 (32d)					
Internal Ceiling 1			3.9000			30.0000	117.0000 (32e)					
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		11396.3146 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							169.2103 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.1742 (36)					
Total fabric heat loss						(33) + (36) =	38.8229 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 27.7223	Feb 27.4348	Mar 27.1473	Apr 26.1190	May 26.1190	Jun 26.1190	Jul 26.1190	Aug 26.1190	Sep 26.1190	Oct 26.1190	Nov 26.1190	Dec 26.5723 (38)
Heat transfer coeff	66.5452	66.2577	65.9702	64.9420	64.9420	64.9420	64.9420	64.9420	64.9420	64.9420	64.9420	65.3952 (39)
Average = Sum(39)m / 12 =												65.3087 (39)
HLP	Jan 0.9881	Feb 0.9838	Mar 0.9795	Apr 0.9642	May 0.9642	Jun 0.9642	Jul 0.9642	Aug 0.9642	Sep 0.9642	Oct 0.9642	Nov 0.9642	Dec 0.9710 (40)
HLP (average)												0.9697 (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	2.1801 (42)
Average daily hot water use (litres/day)	85.9776 (43)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	94.5754	91.1363	87.6972	84.2581	80.8190	77.3799	77.3799	80.8190	84.2581	87.6972	91.1363	94.5754	(44)
Energy content (annual)	140.2526	122.6658	126.5801	110.3556	105.8888	91.3740	84.6714	97.1617	98.3221	114.5850	125.0785	135.8271	(45)
Distribution loss (46)m = 0.15 x (45)m	21.0379	18.3999	18.9870	16.5533	15.8833	13.7061	12.7007	14.5743	14.7483	17.1877	18.7618	20.3741	(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	1.5254	1.2856	1.2766	1.0693	0.9841	0.8131	0.7535	0.9030	0.9527	1.1556	1.3109	1.4773	(61)
Total heat required for water heating calculated for each month	141.7780	123.9514	127.8567	111.4249	106.8730	92.1871	85.4249	98.0648	99.2748	115.7406	126.3894	137.3044	(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	141.7780	123.9514	127.8567	111.4249	106.8730	92.1871	85.4249	98.0648	99.2748	115.7406	126.3894	137.3044	(64)
Heat gains from water heating, kWh/month	47.0153	41.1078	42.4070	36.9606	35.4541	30.5851	28.3416	32.5320	32.9303	38.3884	41.9163	45.5318	(65)
Total per year (kWh/year) = Sum(64)m =													1366.2699 (64)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	109.0055	109.0055	109.0055	109.0055	109.0055	109.0055	109.0055	109.0055	109.0055	109.0055	109.0055	109.0055	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.6886	16.5991	13.4993	10.2198	7.6394	6.4495	6.9689	9.0585	12.1583	15.4377	18.0181	19.2080	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	191.0348	193.0172	188.0217	177.3870	163.9626	151.3456	142.9166	140.9343	145.9297	156.5644	169.9888	182.6059	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.9006	33.9006	33.9006	33.9006	33.9006	33.9006	33.9006	33.9006	33.9006	33.9006	33.9006	33.9006	(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)	-87.2044	-87.2044	-87.2044	-87.2044	-87.2044	-87.2044	-87.2044	-87.2044	-87.2044	-87.2044	-87.2044	-87.2044	(71)
Water heating gains (Table 5)	63.1926	61.1723	56.9987	51.3341	47.6533	42.4794	38.0936	43.7258	45.7365	51.5973	58.2171	61.1987	(72)
Total internal gains	331.6177	329.4902	317.2213	297.6426	277.9570	258.9761	246.6808	252.4203	262.5262	282.3011	304.9257	321.7142	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	3.3400	10.6334	0.6300	0.7000	0.7700	10.8540	(74)
East	2.1700	19.6403	0.6300	0.7000	0.7700	13.0250	(76)
West	3.0000	19.6403	0.6300	0.7000	0.7700	18.0070	(80)

Solar gains	41.8860	81.4477	135.2194	202.4195	254.9545	264.5645	250.3729	210.0652	158.6504	96.7231	52.0831	34.5676	(83)
Total gains	373.5037	410.9379	452.4408	500.0621	532.9115	523.5406	497.0537	462.4855	421.1765	379.0242	357.0088	356.2819	(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	47.5713	47.7777	47.9860	48.7457	48.7457	48.7457	48.7457	48.7457	48.7457	48.7457	48.7457	48.4079	
alpha	4.1714	4.1852	4.1991	4.2497	4.2497	4.2497	4.2497	4.2497	4.2497	4.2497	4.2497	4.2272	
util living area	0.9929	0.9886	0.9768	0.9413	0.8565	0.7065	0.5503	0.6062	0.8337	0.9604	0.9882	0.9942	(86)
MIT	19.5560	19.7105	19.9942	20.3817	20.7105	20.9103	20.9760	20.9640	20.8098	20.3891	19.9210	19.5419	(87)
Th 2	20.0933	20.0969	20.1004	20.1132	20.1132	20.1132	20.1132	20.1132	20.1132	20.1132	20.1132	20.1076	(88)
util rest of house	0.9913	0.9860	0.9712	0.9263	0.8195	0.6341	0.4498	0.5052	0.7777	0.9475	0.9850	0.9929	(89)
MIT 2	18.7658	18.9221	19.2057	19.5933	19.8981	20.0621	20.1042	20.0985	19.9897	19.6057	19.1450	18.7629	(90)
Living area fraction									fLA = Living area / (4) =			0.3574	(91)
MIT	19.0482	19.2038	19.4875	19.8751	20.1884	20.3652	20.4158	20.4078	20.2828	19.8856	19.4224	19.0413	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0482	19.2038	19.4875	19.8751	20.1884	20.3652	20.4158	20.4078	20.2828	19.8856	19.4224	19.0413	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9889	0.9826	0.9665	0.9216	0.8230	0.6560	0.4852	0.5403	0.7897	0.9434	0.9818	0.9908	(94)
Useful gains	369.3631	403.7965	437.2706	460.8695	438.5623	343.4191	241.1821	249.8791	332.5975	357.5834	350.5118	353.0034	(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	981.4236	947.7401	856.7873	712.7431	551.2553	374.4047	247.8053	260.2762	401.5228	603.0280	800.2392	970.5485	(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	455.3730	365.5301	312.1204	181.3490	83.8437	0.0000	0.0000	0.0000	0.0000	182.6108	323.8037	459.4536	(98)
Space heating												2364.0841	(98)
Space heating per m2												35.1015	(99)
(98) / (4) =													

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	2620.9358 (211)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	455.3730	365.5301	312.1204	181.3490	83.8437	0.0000	0.0000	0.0000	0.0000	182.6108	323.8037	459.4536 (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)	504.8481	405.2440	346.0315	201.0521	92.9531	0.0000	0.0000	0.0000	0.0000	202.4509	358.9842	509.3720 (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	141.7780	123.9514	127.8567	111.4249	106.8730	92.1871	85.4249	98.0648	99.2748	115.7406	126.3894	137.3044 (64)
Efficiency of water heater (217)m	86.4298	86.1900	85.6282	84.3051	81.7802	76.2000	76.2000	76.2000	76.2000	84.1988	85.7757	76.2000 (216)
Fuel for water heating, kWh/month	164.0382	143.8118	149.3160	132.1687	130.6832	120.9805	112.1062	128.6939	130.2820	137.4611	147.3488	158.6570 (219)
Water heating fuel used												1655.5472 (219)
Annual totals kWh/year												
Space heating fuel - main system												2620.9358 (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)												45.9631 (230a)
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												120.9631 (231)
Electricity for lighting (calculated in Appendix L)												330.0466 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV Unit 0 (0.80 * 0.80 * 597 * 1.00) =												-382.3114 (233)
Total delivered energy for all uses												4345.1813 (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	2620.9358	0.2160	566.1221 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1655.5472	0.2160	357.5982 (264)
Space and water heating			923.7203 (265)
Pumps and fans	120.9631	0.5190	62.7799 (267)
Energy for lighting	330.0466	0.5190	171.2942 (268)
Energy saving/generation technologies			
PV Unit	-382.3114	0.5190	-198.4196 (269)
Total CO2, kg/year			959.3748 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			14.2400 (273)

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

DER		14.2400 ZC1
Total Floor Area	TFA	67.3500
Assumed number of occupants	N	2.1801
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.8082 ZC2
CO2 emissions from cooking, equation (L16)		2.5438 ZC3
Total CO2 emissions		33.5920 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		33.5920 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	4.0100 (1b)	x 2.8300 (2b)	= 11.3483 (1b) - (3b)
First floor	63.3400 (1c)	x 2.3200 (2c)	= 146.9488 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	67.3500		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 158.2971 (5)
Dwelling volume			

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					20.0000 / (5) = 0.1263 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3763 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3481 (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	0.4439	0.4351	0.4264	0.3829	0.3742	0.3307	0.3307	0.3220	0.3481	0.3742	0.3916	0.4090 (22b)
Effective ac	0.5985	0.5947	0.5909	0.5733	0.5700	0.5547	0.5547	0.5518	0.5606	0.5700	0.5767	0.5837 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1500	1.0000	2.1500		(26)
TER Opening Type (Uw = 1.40)			8.5100	1.3258	11.2822		(27)
Ground Floor			3.9000	0.1300	0.5070		(28a)
Brick and Block	6.3000	2.1500	4.1500	0.1800	0.7470		(29a)
First Floor	57.2600	8.5100	48.7500	0.1800	8.7750		(29a)
Pitched Roof	63.3400		63.3400	0.1300	8.2342		(30)
Total net area of external elements Aum(A, m ²)			130.8000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.6954		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.5452 (36)
Total fabric heat loss						(33) + (36) =	40.2406 (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	31.2646	31.0648	30.8689	29.9490	29.7769	28.9757	28.9757	28.8273	29.2843	29.7769	30.1251	30.4891 (38)
Heat transfer coeff	71.5052	71.3054	71.1095	70.1896	70.0175	69.2163	69.2163	69.0679	69.5249	70.0175	70.3657	70.7297 (39)
Average = Sum(39)m / 12 =												70.1888 (39)
HLP	1.0617	1.0587	1.0558	1.0422	1.0396	1.0277	1.0277	1.0255	1.0323	1.0396	1.0448	1.0502 (40)
HLP (average)												1.0421 (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												2.1801 (42)
Average daily hot water use (litres/day)												85.9776 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	94.5754	91.1363	87.6972	84.2581	80.8190	77.3799	77.3799	80.8190	84.2581	87.6972	91.1363	94.5754 (44)
Energy content (annual)	140.2526	122.6658	126.5801	110.3556	105.8888	91.3740	84.6714	97.1617	98.3221	114.5850	125.0785	135.8271 (45)
Distribution loss (46)m = 0.15 x (45)m	21.0379	18.3999	18.9870	16.5533	15.8833	13.7061	12.7007	14.5743	14.7483	17.1877	18.7618	20.3741 (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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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	48.1946	41.9477	44.6895	41.5519	41.1845	38.1599	39.4319	41.1845	41.5519	44.6895	44.9439	48.1946 (61)
Total heat required for water heating calculated for each month	188.4471	164.6134	171.2696	151.9075	147.0733	129.5339	124.1034	138.3462	139.8741	159.2745	170.0224	184.0217 (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	188.4471	164.6134	171.2696	151.9075	147.0733	129.5339	124.1034	138.3462	139.8741	159.2745	170.0224	184.0217 (64)
Heat gains from water heating, kWh/month	58.6826	51.2733	53.2603	47.0812	45.5041	39.9218	38.0112	42.6024	43.0801	49.2719	52.8246	57.2112 (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	109.0055	109.0055	109.0055	109.0055	109.0055	109.0055	109.0055	109.0055	109.0055	109.0055	109.0055	109.0055 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.6886	16.5991	13.4993	10.2198	7.6394	6.4495	6.9689	9.0585	12.1583	15.4377	18.0181	19.2080 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	191.0348	193.0172	188.0217	177.3870	163.9626	151.3456	142.9166	140.9343	145.9297	156.5644	169.9888	182.6059 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.9006	33.9006	33.9006	33.9006	33.9006	33.9006	33.9006	33.9006	33.9006	33.9006	33.9006	33.9006 (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)	-87.2044	-87.2044	-87.2044	-87.2044	-87.2044	-87.2044	-87.2044	-87.2044	-87.2044	-87.2044	-87.2044	-87.2044 (71)
Water heating gains (Table 5)	78.8745	76.2995	71.5864	65.3906	61.1615	55.4470	51.0904	57.2613	59.8335	66.2256	73.3675	76.8967 (72)
Total internal gains	347.2996	344.6174	331.8090	311.6991	291.4652	271.9437	259.6776	265.9557	276.6231	296.9295	320.0760	337.4123 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W		
North				3.3400	10.6334	0.6300	0.7000	0.7700		10.8540 (74)		
East				2.1700	19.6403	0.6300	0.7000	0.7700		13.0250 (76)		
West				3.0000	19.6403	0.6300	0.7000	0.7700		18.0070 (80)		

Solar gains	41.8860	81.4477	135.2194	202.4195	254.9545	264.5645	250.3729	210.0652	158.6504	96.7231	52.0831	34.5676 (83)
Total gains	389.1856	426.0651	467.0285	514.1186	546.4197	536.5083	510.0505	476.0209	435.2735	393.6526	372.1591	371.9799 (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	65.4090	65.5923	65.7730	66.6350	66.7988	67.5720	67.5720	67.7172	67.2721	66.7988	66.4683	66.1262
alpha	5.3606	5.3728	5.3849	5.4423	5.4533	5.5048	5.5048	5.5145	5.4848	5.4533	5.4312	5.4084
util living area	0.9983	0.9969	0.9923	0.9733	0.9088	0.7553	0.5825	0.6417	0.8838	0.9836	0.9967	0.9987 (86)
MIT	19.8583	19.9744	20.1946	20.5037	20.7800	20.9461	20.9894	20.9825	20.8646	20.5148	20.1368	19.8400 (87)
Th 2	20.0322	20.0347	20.0371	20.0483	20.0505	20.0603	20.0603	20.0621	20.0565	20.0505	20.0462	20.0417 (88)
util rest of house	0.9978	0.9959	0.9894	0.9626	0.8721	0.6707	0.4657	0.5236	0.8240	0.9753	0.9954	0.9983 (89)
MIT 2	18.5032	18.6746	18.9970	19.4492	19.8251	20.0225	20.0561	20.0544	19.9407	19.4715	18.9207	18.4834 (90)
Living area fraction	18.9875	19.1391	19.4250	19.8261	20.1664	20.3526	20.3897	20.3861	20.2709	19.8444	19.3553	18.9682 (92)
Temperature adjustment	18.9875	19.1391	19.4250	19.8261	20.1664	20.3526	20.3897	20.3861	20.2709	19.8444	19.3553	18.9682 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9969	0.9945	0.9870	0.9595	0.8773	0.6989	0.5078	0.5661	0.8396	0.9729	0.9941	0.9976 (94)
Ext temp.	387.9867	423.7282	460.9505	493.3105	479.3668	374.9502	258.9866	269.4802	365.4640	382.9775	369.9449	371.0789 (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	1050.2317	1015.3256	919.0894	766.8964	592.7940	398.1741	262.3069	275.3129	429.0312	647.2663	862.3537	1044.5506 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating per m2	492.7103	397.5534	340.8553	196.9819	84.3899	0.0000	0.0000	0.0000	0.0000	196.6309	354.5343	501.0629 (98)
												2564.7189 (98)
												38.0805 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2745.9517 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	492.7103	397.5534	340.8553	196.9819	84.3899	0.0000	0.0000	0.0000	0.0000	196.6309	354.5343	501.0629	(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)	527.5271	425.6461	364.9414	210.9013	90.3532	0.0000	0.0000	0.0000	0.0000	210.5255	379.5871	536.4700	(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	188.4471	164.6134	171.2696	151.9075	147.0733	129.5339	124.1034	138.3462	139.8741	159.2745	170.0224	184.0217	(64)
Efficiency of water heater (217)m	87.3601	87.1888	86.7509	85.7064	83.7099	80.3000	80.3000	80.3000	80.3000	85.5827	86.8589	87.4456	(216)
Fuel for water heating, kWh/month	215.7131	188.8011	197.4269	177.2418	175.6941	161.3125	154.5497	172.2866	174.1894	186.1059	195.7454	210.4413	(219)
Water heating fuel used												2209.5078	(219)
Annual totals kWh/year													
Space heating fuel - main system												2745.9517	(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)												330.0466	(232)
Total delivered energy for all uses												5360.5060	(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	2745.9517	0.2160	593.1256 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2209.5078	0.2160	477.2537 (264)
Space and water heating			1070.3792 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	330.0466	0.5190	171.2942 (268)
Total CO2, kg/m2/year			1280.5984 (272)
Emissions per m2 for space and water heating			15.8928 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.5433 (272b)
Emissions per m2 for pumps and fans			0.5780 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.8928 * 1.00) + 2.5433 + 0.5780, rounded to 2 d.p.			19.0100 (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	4.0100 (1b)	x 2.8300 (2b)	= 11.3483 (1b) - (3b)
First floor	63.3400 (1c)	x 2.3200 (2c)	= 146.9488 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	67.3500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 158.2971 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					20.0000 / (5) = 0.1263 (8)
Pressure test					Yes
Measured/design AP50					4.7600
Infiltration rate					0.3643 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3370 (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	0.4297	0.4213	0.4128	0.3707	0.3623	0.3202	0.3202	0.3117	0.3370	0.3623	0.3791	0.3960 (22b)
Effective ac	0.5923	0.5887	0.5852	0.5687	0.5656	0.5513	0.5513	0.5486	0.5568	0.5656	0.5719	0.5784 (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)			8.5100	1.1450	9.7443		(27)
Ground Floor			3.9000	0.1200	0.4680	84.0000	327.6000 (28a)
Brick and Block	6.3000	2.1500	4.1500	0.2500	1.0375	68.2600	283.2790 (29a)
First Floor	57.2600	8.5100	48.7500	0.2400	11.7000	42.2200	2058.2250 (29a)
Pitched Roof	63.3400		63.3400	0.1000	6.3340	9.1000	576.3940 (30)
Total net area of external elements Aum(A, m ²)			130.8000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.6488		(33)
Party Wall 1			21.2600	0.0000	0.0000	58.0600	1234.3556 (32)
Party Wall 2			20.3500	0.0000	0.0000	58.0600	1181.5210 (32)
Party Floor 1			59.7400			70.0000	4181.8000 (32d)
Stud partition			128.4600			9.0000	1156.1400 (32c)
Internal Floor 1			4.0000			70.0000	280.0000 (32d)
Internal Ceiling 1			3.9000			30.0000	117.0000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	11396.3146 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							169.2103 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.1742 (36)
Total fabric heat loss						(33) + (36) =	38.8229 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	30.9417	30.7544	30.5708	29.7087	29.5473	28.7964	28.7964	28.6574	29.0857	29.5473	29.8737	30.2148 (38)
Heat transfer coeff	69.7646	69.5773	69.3938	68.5316	68.3703	67.6194	67.6194	67.4803	67.9086	68.3703	68.6966	69.0378 (39)
Average = Sum(39)m / 12 =												68.5308 (39)
HLP	1.0359	1.0331	1.0303	1.0175	1.0151	1.0040	1.0040	1.0019	1.0083	1.0151	1.0200	1.0251 (40)
HLP (average)												1.0175 (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												2.1801 (42)
Average daily hot water use (litres/day)												85.9776 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	94.5754	91.1363	87.6972	84.2581	80.8190	77.3799	77.3799	80.8190	84.2581	87.6972	91.1363	94.5754 (44)

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Energy conte	140.2526	122.6658	126.5801	110.3556	105.8888	91.3740	84.6714	97.1617	98.3221	114.5850	125.0785	135.8271	(45)
Energy content (annual)										Total =	Sum (45)m =	1352.7627	(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	29.8037	26.0665	26.8983	23.4506	22.5014	19.4170	17.9927	20.6469	20.8935	24.3493	26.5792	28.8633	(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	109.0055	109.0055	109.0055	109.0055	109.0055	109.0055	109.0055	109.0055	109.0055	109.0055	109.0055	109.0055	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.6886	16.5991	13.4993	10.2198	7.6394	6.4495	6.9689	9.0585	12.1583	15.4377	18.0181	19.2080	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	191.0348	193.0172	188.0217	177.3870	163.9626	151.3456	142.9166	140.9343	145.9297	156.5644	169.9888	182.6059	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.9006	33.9006	33.9006	33.9006	33.9006	33.9006	33.9006	33.9006	33.9006	33.9006	33.9006	33.9006	(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)	-87.2044	-87.2044	-87.2044	-87.2044	-87.2044	-87.2044	-87.2044	-87.2044	-87.2044	-87.2044	-87.2044	-87.2044	(71)
Water heating gains (Table 5)	40.0587	38.7894	36.1536	32.5702	30.2438	26.9680	24.1837	27.7512	29.0187	32.7276	36.9155	38.7947	(72)
Total internal gains	305.4838	304.1073	293.3762	275.8787	257.5475	240.4648	229.7709	233.4456	242.8083	260.4314	280.6241	296.3102	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g Specific data or Table 6c	FF	Access factor Table 6d	Gains W
North	3.3400	10.6334	0.6300	0.7000	0.7700	10.8540	(74)
East	2.1700	19.6403	0.6300	0.7000	0.7700	13.0250	(76)
West	3.0000	19.6403	0.6300	0.7000	0.7700	18.0070	(80)

Solar gains	41.8860	81.4477	135.2194	202.4195	254.9545	264.5645	250.3729	210.0652	158.6504	96.7231	52.0831	34.5676	(83)
Total gains	347.3698	385.5550	428.5957	478.2982	512.5020	505.0293	480.1438	443.5108	401.4587	357.1545	332.7072	330.8779	(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	45.3761	45.4982	45.6185	46.1925	46.3014	46.8156	46.8156	46.9121	46.6162	46.3014	46.0815	45.8538	
alpha	4.0251	4.0332	4.0412	4.0795	4.0868	4.1210	4.1210	4.1275	4.1077	4.0868	4.0721	4.0569	
util living area	0.9946	0.9911	0.9815	0.9522	0.8794	0.7382	0.5838	0.6425	0.8610	0.9692	0.9911	0.9956	(86)
MIT	19.4209	19.5769	19.8703	20.2765	20.6414	20.8835	20.9665	20.9506	20.7615	20.2933	19.7907	19.3957	(87)
Th 2	20.0536	20.0559	20.0581	20.0687	20.0707	20.0800	20.0800	20.0817	20.0764	20.0707	20.0667	20.0625	(88)
util rest of house	0.9933	0.9890	0.9769	0.9393	0.8451	0.6651	0.4765	0.5364	0.8086	0.9586	0.9886	0.9946	(89)
MIT 2	18.6008	18.7579	19.0506	19.4568	19.8011	20.0127	20.0673	20.0613	19.9188	19.4797	18.9798	18.5825	(90)
Living area fraction	18.8939	19.0506	19.3436	19.7498	20.1014	20.3239	20.3887	20.3791	20.2200	19.7705	19.2696	18.8731	(91)
MIT	18.8939	19.0506	19.3436	19.7498	20.1014	20.3239	20.3887	20.3791	20.2200	19.7705	19.2696	18.8731	(92)
Temperature adjustment	18.8939	19.0506	19.3436	19.7498	20.1014	20.3239	20.3887	20.3791	20.2200	19.7705	19.2696	18.8731	(93)
adjusted MIT	18.8939	19.0506	19.3436	19.7498	20.1014	20.3239	20.3887	20.3791	20.2200	19.7705	19.2696	18.8731	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9913	0.9860	0.9724	0.9340	0.8464	0.6860	0.5141	0.5728	0.8179	0.9542	0.9857	0.9928	(94)
Ext temp.	344.3377	380.1596	416.7560	446.7340	433.7572	346.4511	246.8385	254.0549	328.3463	340.8081	327.9614	328.4900	(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	1018.1396	984.5607	891.2635	743.5518	574.4063	387.0490	256.1894	268.5094	415.5987	626.9869	836.0104	1013.0009	(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 per m2	501.3086	406.1575	353.0336	213.7088	104.6430	0.0000	0.0000	0.0000	0.0000	212.9170	365.7953	509.2761	(98)
												2666.8399	(98)
												39.5967	(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													

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Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	635.6219	500.3832	512.8502	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.8265	0.8902	0.8626	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	525.3364	445.4322	442.3862	0.0000	0.0000	0.0000	0.0000 (102)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	672.0750	641.4210	600.1408	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	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	0.0000	0.0000	0.0000	0.0000	0.0000	105.6518	145.8157	117.3694	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									FC = cooled area / (4) =			368.8369 (104)
Intermittency factor (Table 10b)												1.0000 (105)
Space cooling kWh	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	0.0000	0.0000	0.0000	0.0000	0.0000	26.4129	36.4539	29.3423	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling per m2												92.2092 (107)
Energy for space heating												1.3691 (108)
Energy for space cooling												39.5967 (99)
Total												1.3691 (108)
Dwelling Fabric Energy Efficiency (DFEE)												40.9658 (109)
												41.0 (109)

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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	4.0100 (1b)	x 2.8300 (2b)	= 11.3483 (1b) - (3b)
First floor	63.3400 (1c)	x 2.3200 (2c)	= 146.9488 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	67.3500		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 158.2971 (5)
Dwelling volume			

2. Ventilation rate

										main	secondary	other	total	m3 per hour			
										heating	heating						
Number of chimneys										0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues										0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans																2 * 10 =	20.0000 (7a)
Number of passive vents																0 * 10 =	0.0000 (7b)
Number of flueless gas fires																0 * 40 =	0.0000 (7c)
										Air changes per hour							
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =										20.0000 / (5) =							0.1263 (8)
Pressure test										Yes							
Measured/design AP50																	5.0000
Infiltration rate																	0.3763 (18)
Number of sides sheltered																	1 (19)
Shelter factor										(20) = 1 - [0.075 x (19)] =							0.9250 (20)
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =							0.3481 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec					
Wind factor	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)				
Adj infilt rate	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)				
	0.4439	0.4351	0.4264	0.3829	0.3742	0.3307	0.3307	0.3220	0.3481	0.3742	0.3916	0.4090	(22b)				
Effective ac	0.5985	0.5947	0.5909	0.5733	0.5700	0.5547	0.5547	0.5518	0.5606	0.5700	0.5767	0.5837	(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)			8.5100	1.3258	11.2822			(27)					
Ground Floor			3.9000	0.1300	0.5070			(28a)					
Brick and Block	6.3000	2.1500	4.1500	0.1800	0.7470			(29a)					
First Floor	57.2600	8.5100	48.7500	0.1800	8.7750			(29a)					
Pitched Roof	63.3400		63.3400	0.1300	8.2342			(30)					
Total net area of external elements Aum(A, m2)			130.8000					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.6954			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								8.5452 (36)					
Total fabric heat loss						(33) + (36) =		40.2406 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 31.2646	Feb 31.0648	Mar 30.8689	Apr 29.9490	May 29.7769	Jun 28.9757	Jul 28.9757	Aug 28.8273	Sep 29.2843	Oct 29.7769	Nov 30.1251	Dec 30.4891	(38)
Heat transfer coeff	71.5052	71.3054	71.1095	70.1896	70.0175	69.2163	69.2163	69.0679	69.5249	70.0175	70.3657	70.7297	(39)
Average = Sum(39)m / 12 =												70.1888	(39)
HLP	Jan 1.0617	Feb 1.0587	Mar 1.0558	Apr 1.0422	May 1.0396	Jun 1.0277	Jul 1.0277	Aug 1.0255	Sep 1.0323	Oct 1.0396	Nov 1.0448	Dec 1.0502	(40)
HLP (average)												1.0421	(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												2.1801 (42)
Average daily hot water use (litres/day)												85.9776 (43)
Daily hot water use	Jan 94.5754	Feb 91.1363	Mar 87.6972	Apr 84.2581	May 80.8190	Jun 77.3799	Jul 77.3799	Aug 80.8190	Sep 84.2581	Oct 87.6972	Nov 91.1363	Dec 94.5754 (44)
Energy conte	140.2526	122.6658	126.5801	110.3556	105.8888	91.3740	84.6714	97.1617	98.3221	114.5850	125.0785	135.8271 (45)
Energy content (annual)										Total = Sum(45)m =		1352.7627 (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)

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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	29.8037	26.0665	26.8983	23.4506	22.5014	19.4170	17.9927	20.6469	20.8935	24.3493	26.5792	28.8633 (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	109.0055	109.0055	109.0055	109.0055	109.0055	109.0055	109.0055	109.0055	109.0055	109.0055	109.0055	109.0055	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.6886	16.5991	13.4993	10.2198	7.6394	6.4495	6.9689	9.0585	12.1583	15.4377	18.0181	19.2080	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	191.0348	193.0172	188.0217	177.3870	163.9626	151.3456	142.9166	140.9343	145.9297	156.5644	169.9888	182.6059	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.9006	33.9006	33.9006	33.9006	33.9006	33.9006	33.9006	33.9006	33.9006	33.9006	33.9006	33.9006	(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)	-87.2044	-87.2044	-87.2044	-87.2044	-87.2044	-87.2044	-87.2044	-87.2044	-87.2044	-87.2044	-87.2044	-87.2044	(71)
Water heating gains (Table 5)	40.0587	38.7894	36.1536	32.5702	30.2438	26.9680	24.1837	27.7512	29.0187	32.7276	36.9155	38.7947	(72)
Total internal gains	305.4838	304.1073	293.3762	275.8787	257.5475	240.4648	229.7709	233.4456	242.8083	260.4314	280.6241	296.3102	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	3.3400	10.6334	0.6300	0.7000	0.7700	10.8540	(74)
East	2.1700	19.6403	0.6300	0.7000	0.7700	13.0250	(76)
West	3.0000	19.6403	0.6300	0.7000	0.7700	18.0070	(80)

Solar gains	41.8860	81.4477	135.2194	202.4195	254.9545	264.5645	250.3729	210.0652	158.6504	96.7231	52.0831	34.5676	(83)
Total gains	347.3698	385.5550	428.5957	478.2982	512.5020	505.0293	480.1438	443.5108	401.4587	357.1545	332.7072	330.8779	(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	65.4090	65.5923	65.7730	66.6350	66.7988	67.5720	67.5720	67.7172	67.2721	66.7988	66.4683	66.1262	
alpha	5.3606	5.3728	5.3849	5.4423	5.4533	5.5048	5.5048	5.5145	5.4848	5.4533	5.4312	5.4084	
util living area	0.9991	0.9981	0.9948	0.9803	0.9267	0.7859	0.6143	0.6799	0.9103	0.9894	0.9981	0.9993	(86)
MIT	19.7995	19.9178	20.1420	20.4589	20.7492	20.9343	20.9863	20.9769	20.8372	20.4666	20.0816	19.7820	(87)
Th 2	20.0322	20.0347	20.0371	20.0483	20.0505	20.0603	20.0603	20.0621	20.0565	20.0505	20.0462	20.0417	(88)
util rest of house	0.9987	0.9974	0.9928	0.9722	0.8949	0.7033	0.4933	0.5589	0.8586	0.9838	0.9973	0.9990	(89)
MIT 2	18.9296	19.0497	19.2751	19.5967	19.8711	20.0279	20.0565	20.0549	19.9576	19.6088	19.2228	18.9198	(90)
Living area fraction	19.2405	19.3599	19.5849	19.9048	20.1849	20.3518	20.3888	20.3845	20.2719	19.9154	19.5297	19.2279	(92)
MIT	19.2405	19.3599	19.5849	19.9048	20.1849	20.3518	20.3888	20.3845	20.2719	19.9154	19.5297	19.2279	(93)
Temperature adjustment													0.0000
adjusted MIT	19.2405	19.3599	19.5849	19.9048	20.1849	20.3518	20.3888	20.3845	20.2719	19.9154	19.5297	19.2279	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9984	0.9968	0.9916	0.9706	0.9001	0.7311	0.5371	0.6028	0.8725	0.9827	0.9967	0.9987	(94)
Ext temp.	346.8011	384.3297	425.0130	464.2448	461.3279	369.2133	257.9012	267.3315	350.2737	350.9730	331.6227	330.4641	(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	1068.3220	1031.0716	930.4617	772.4261	594.0933	398.1187	262.2492	275.1977	429.1031	652.2401	874.6259	1062.9213	(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	536.8115	434.6105	376.0539	221.8905	98.7774	0.0000	0.0000	0.0000	0.0000	224.1428	390.9623	544.9482	(98)
Space heating per m2												2828.1971	(98)
												41.9925	(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	650.6331	512.2005	524.9161	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8596	0.9240	0.8971	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	559.3147	473.2852	470.9057	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	672.0750	641.4210	600.1408	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	81.1874	125.0931	96.1509	0.0000	0.0000	0.0000	0.0000	(104)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling												302.4314 (104)
Cooled fraction												1.0000 (105)
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	0.0000	20.2969	31.2733	24.0377	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												75.6078 (107)
Space cooling per m2												1.1226 (108)
Energy for space heating												41.9925 (99)
Energy for space cooling												1.1226 (108)
Total												43.1151 (109)
Target Fabric Energy Efficiency (TFEE)												49.6 (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	4.0100 (1b)	x 2.8300 (2b)	= 11.3483 (1b) - (3b)
First floor	63.3400 (1c)	x 2.3200 (2c)	= 146.9488 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	67.3500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 158.2971 (5)

2. Ventilation rate

					main heating	secondary heating	other		total	m3 per hour		
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans											0 * 10 =	0.0000 (7a)
Number of passive vents											0 * 10 =	0.0000 (7b)
Number of flueless gas fires											0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =											0.0000 / (5) =	0.0000 (8)
Pressure test											Yes	
Measured/design AP50												4.7600
Infiltration rate												0.2380 (18)
Number of sides sheltered												1 (19)
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.2202 (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	0.2587	0.2422	0.2422	0.2202	0.2257	0.2146	0.2146	0.2091	0.2091	0.2257	0.2202	0.2257 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5087	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)			8.5100	1.1450	9.7443		(27)					
Ground Floor			3.9000	0.1200	0.4680	84.0000	327.6000 (28a)					
Brick and Block	6.3000	2.1500	4.1500	0.2500	1.0375	68.2600	283.2790 (29a)					
First Floor	57.2600	8.5100	48.7500	0.2400	11.7000	42.2200	2058.2250 (29a)					
Pitched Roof	63.3400		63.3400	0.1000	6.3340	9.1000	576.3940 (30)					
Total net area of external elements Aum(A, m2)			130.8000				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		31.6488		(33)					
Party Wall 1			21.2600	0.0000	0.0000	58.0600	1234.3556 (32)					
Party Wall 2			20.3500	0.0000	0.0000	58.0600	1181.5210 (32)					
Party Floor 1			59.7400			70.0000	4181.8000 (32d)					
Stud partition			128.4600			9.0000	1156.1400 (32c)					
Internal Floor 1			4.0000			70.0000	280.0000 (32d)					
Internal Ceiling 1			3.9000			30.0000	117.0000 (32e)					
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		11396.3146 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							169.2103 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.1742 (36)					
Total fabric heat loss					(33) + (36) =		38.8229 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 26.5723	Feb 26.1190	Mar 26.1190	Apr 26.1190	May 26.1190	Jun 26.1190	Jul 26.1190	Aug 26.1190	Sep 26.1190	Oct 26.1190	Nov 26.1190	Dec 26.1190 (38)
Heat transfer coeff	65.3952	64.9420	64.9420	64.9420	64.9420	64.9420	64.9420	64.9420	64.9420	64.9420	64.9420	64.9420 (39)
Average = Sum(39)m / 12 =												64.9797 (39)
HLP	Jan 0.9710	Feb 0.9642	Mar 0.9642	Apr 0.9642	May 0.9642	Jun 0.9642	Jul 0.9642	Aug 0.9642	Sep 0.9642	Oct 0.9642	Nov 0.9642	Dec 0.9642 (40)
HLP (average)												0.9648 (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	2.1801 (42)
Average daily hot water use (litres/day)	85.9776 (43)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	94.5754	91.1363	87.6972	84.2581	80.8190	77.3799	77.3799	80.8190	84.2581	87.6972	91.1363	94.5754	(44)
Energy content (annual)	140.2526	122.6658	126.5801	110.3556	105.8888	91.3740	84.6714	97.1617	98.3221	114.5850	125.0785	135.8271	(45)
Distribution loss (46)m = 0.15 x (45)m	21.0379	18.3999	18.9870	16.5533	15.8833	13.7061	12.7007	14.5743	14.7483	17.1877	18.7618	20.3741	(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	1.5254	1.2856	1.2766	1.0693	0.9841	0.8131	0.7535	0.9030	0.9527	1.1556	1.3109	1.4773	(61)
Total heat required for water heating calculated for each month	141.7780	123.9514	127.8567	111.4249	106.8730	92.1871	85.4249	98.0648	99.2748	115.7406	126.3894	137.3044	(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	141.7780	123.9514	127.8567	111.4249	106.8730	92.1871	85.4249	98.0648	99.2748	115.7406	126.3894	137.3044	(64)
RHI water heating demand	47.0153	41.1078	42.4070	36.9606	35.4541	30.5851	28.3416	32.5320	32.9303	38.3884	41.9163	45.5318	(65)
Heat gains from water heating, kWh/month													
	47.0153	41.1078	42.4070	36.9606	35.4541	30.5851	28.3416	32.5320	32.9303	38.3884	41.9163	45.5318	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts	130.8066	130.8066	130.8066	130.8066	130.8066	130.8066	130.8066	130.8066	130.8066	130.8066	130.8066	130.8066	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	46.7215	41.4976	33.7481	25.5495	19.0986	16.1238	17.4223	22.6462	30.3957	38.5943	45.0453	48.0200	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	285.1266	288.0853	280.6294	264.7568	244.7203	225.8889	213.3084	210.3496	217.8055	233.6782	253.7147	272.5461	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.2608	50.2608	50.2608	50.2608	50.2608	50.2608	50.2608	50.2608	50.2608	50.2608	50.2608	50.2608	(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)	-87.2044	-87.2044	-87.2044	-87.2044	-87.2044	-87.2044	-87.2044	-87.2044	-87.2044	-87.2044	-87.2044	-87.2044	(71)
Water heating gains (Table 5)	63.1926	61.1723	56.9987	51.3341	47.6533	42.4794	38.0936	43.7258	45.7365	51.5973	58.2171	61.1987	(72)
Total internal gains	491.9037	487.6182	468.2393	438.5034	408.3352	381.3550	365.6873	373.5847	390.8007	420.7329	453.8400	478.6278	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
North				3.3400	13.4684	0.6300	0.7000			0.7700			13.7479 (74)
East				2.1700	25.1733	0.6300	0.7000			0.7700			16.6944 (76)
West				3.0000	25.1733	0.6300	0.7000			0.7700			23.0798 (80)
Solar gains	53.5221	88.8211	150.2921	225.3591	266.2246	305.1423	277.6709	243.7958	184.4923	113.9099	66.3959		41.7716 (83)
Total gains	545.4258	576.4393	618.5313	663.8624	674.5597	686.4974	643.3582	617.3805	575.2931	534.6427	520.2359		520.3993 (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	48.4079	48.7457	48.7457	48.7457	48.7457	48.7457	48.7457	48.7457	48.7457	48.7457	48.7457	48.7457		
alpha	4.2272	4.2497	4.2497	4.2497	4.2497	4.2497	4.2497	4.2497	4.2497	4.2497	4.2497	4.2497		
util living area	0.9642	0.9531	0.9187	0.8346	0.6859	0.4709	0.3310	0.3344	0.5958	0.8397	0.9385	0.9685	(86)	
MIT	20.0575	20.1667	20.4075	20.6982	20.9012	20.9845	20.9974	20.9973	20.9589	20.7468	20.3780	20.0393	(87)	
Th 2	20.1076	20.1132	20.1132	20.1132	20.1132	20.1132	20.1132	20.1132	20.1132	20.1132	20.1132	20.1132	(88)	
util rest of house	0.9566	0.9433	0.9016	0.8011	0.6278	0.3937	0.2431	0.2429	0.5144	0.7984	0.9235	0.9616	(89)	
MIT 2	19.2713	19.3818	19.6130	19.8807	20.0506	20.1067	20.1127	20.1127	20.0933	19.9297	19.5888	19.2585	(90)	
Living area fraction	19.5523	19.6623	19.8969	20.1729	20.3546	20.4204	20.4288	20.4289	20.4026	20.2217	19.8709	19.5376	(92)	
MIT	19.5523	19.6623	19.8969	20.1729	20.3546	20.4204	20.4288	20.4289	20.4026	20.2217	19.8709	19.5376	(93)	
Temperature adjustment														
adjusted MIT	19.5523	19.6623	19.8969	20.1729	20.3546	20.4204	20.4288	20.4289	20.4026	20.2217	19.8709	19.5376	(93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9510	0.9375	0.8969	0.8035	0.6444	0.4209	0.2746	0.2757	0.5419	0.8040	0.9187	0.9562	(94)
Useful gains	518.6867	540.3885	554.7710	533.4151	434.6802	288.9662	176.6800	170.1982	311.7580	429.8445	477.9263	497.6124	(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	912.4141	887.2574	798.5874	654.1524	471.1264	293.5642	177.2164	170.7227	324.8814	527.4412	731.9515	898.6390	(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	292.9331	233.0959	181.3994	86.9309	27.1159	0.0000	0.0000	0.0000	0.0000	72.6120	182.8981	298.3638	(98)
Space heating												1375.3491	(98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF HEAT DEMAND 09 Jan 2014

RHI space heating demand

1375 (98)

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	4.0100 (1b)	x 2.8300 (2b)	= 11.3483 (1b) - (3b)
First floor	63.3400 (1c)	x 2.3200 (2c)	= 146.9488 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	67.3500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 158.2971 (5)

2. Ventilation rate

					main heating	secondary heating	other		total	m3 per hour		
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans											0 * 10 =	0.0000 (7a)
Number of passive vents											0 * 10 =	0.0000 (7b)
Number of flueless gas fires											0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =											0.0000 / (5) =	0.0000 (8)
Pressure test											Yes	
Measured/design AP50												4.7600
Infiltration rate												0.2380 (18)
Number of sides sheltered												1 (19)
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.2202 (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												
	0.2807	0.2752	0.2697	0.2422	0.2367	0.2091	0.2091	0.2036	0.2202	0.2367	0.2477	0.2587 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5307	0.5252	0.5197	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5087 (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)			8.5100	1.1450	9.7443		(27)					
Ground Floor			3.9000	0.1200	0.4680	84.0000	327.6000 (28a)					
Brick and Block	6.3000	2.1500	4.1500	0.2500	1.0375	68.2600	283.2790 (29a)					
First Floor	57.2600	8.5100	48.7500	0.2400	11.7000	42.2200	2058.2250 (29a)					
Pitched Roof	63.3400		63.3400	0.1000	6.3340	9.1000	576.3940 (30)					
Total net area of external elements Aum(A, m2)			130.8000				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		31.6488		(33)					
Party Wall 1			21.2600	0.0000	0.0000	58.0600	1234.3556 (32)					
Party Wall 2			20.3500	0.0000	0.0000	58.0600	1181.5210 (32)					
Party Floor 1			59.7400			70.0000	4181.8000 (32d)					
Stud partition			128.4600			9.0000	1156.1400 (32c)					
Internal Floor 1			4.0000			70.0000	280.0000 (32d)					
Internal Ceiling 1			3.9000			30.0000	117.0000 (32e)					
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		11396.3146 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							169.2103 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.1742 (36)					
Total fabric heat loss						(33) + (36) =	38.8229 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 27.7223	Feb 27.4348	Mar 27.1473	Apr 26.1190	May 26.1190	Jun 26.1190	Jul 26.1190	Aug 26.1190	Sep 26.1190	Oct 26.1190	Nov 26.1190	Dec 26.5723 (38)
Heat transfer coeff	66.5452	66.2577	65.9702	64.9420	64.9420	64.9420	64.9420	64.9420	64.9420	64.9420	64.9420	65.3952 (39)
Average = Sum(39)m / 12 =												65.3087 (39)
HLP	Jan 0.9881	Feb 0.9838	Mar 0.9795	Apr 0.9642	May 0.9642	Jun 0.9642	Jul 0.9642	Aug 0.9642	Sep 0.9642	Oct 0.9642	Nov 0.9642	Dec 0.9710 (40)
HLP (average)												0.9697 (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	2.1801 (42)
Average daily hot water use (litres/day)	85.9776 (43)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	94.5754	91.1363	87.6972	84.2581	80.8190	77.3799	77.3799	80.8190	84.2581	87.6972	91.1363	94.5754	(44)
Energy conte	140.2526	122.6658	126.5801	110.3556	105.8888	91.3740	84.6714	97.1617	98.3221	114.5850	125.0785	135.8271	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m	21.0379	18.3999	18.9870	16.5533	15.8833	13.7061	12.7007	14.5743	14.7483	17.1877	18.7618	20.3741	(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													
Combi loss	1.5254	1.2856	1.2766	1.0693	0.9841	0.8131	0.7535	0.9030	0.9527	1.1556	1.3109	1.4773	(61)
Total heat required for water heating calculated for each month	141.7780	123.9514	127.8567	111.4249	106.8730	92.1871	85.4249	98.0648	99.2748	115.7406	126.3894	137.3044	(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	141.7780	123.9514	127.8567	111.4249	106.8730	92.1871	85.4249	98.0648	99.2748	115.7406	126.3894	137.3044	(64)
Heat gains from water heating, kWh/month	47.0153	41.1078	42.4070	36.9606	35.4541	30.5851	28.3416	32.5320	32.9303	38.3884	41.9163	45.5318	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	130.8066	130.8066	130.8066	130.8066	130.8066	130.8066	130.8066	130.8066	130.8066	130.8066	130.8066	130.8066	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	46.7215	41.4976	33.7481	25.5495	19.0986	16.1238	17.4223	22.6462	30.3957	38.5943	45.0453	48.0200	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	285.1266	288.0853	280.6294	264.7568	244.7203	225.8889	213.3084	210.3496	217.8055	233.6782	253.7147	272.5461	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.2608	50.2608	50.2608	50.2608	50.2608	50.2608	50.2608	50.2608	50.2608	50.2608	50.2608	50.2608	(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)	-87.2044	-87.2044	-87.2044	-87.2044	-87.2044	-87.2044	-87.2044	-87.2044	-87.2044	-87.2044	-87.2044	-87.2044	(71)
Water heating gains (Table 5)	63.1926	61.1723	56.9987	51.3341	47.6533	42.4794	38.0936	43.7258	45.7365	51.5973	58.2171	61.1987	(72)
Total internal gains	491.9037	487.6182	468.2393	438.5034	408.3352	381.3550	365.6873	373.5847	390.8007	420.7329	453.8400	478.6278	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d	Gains W		
North				3.3400	10.6334	0.6300	0.7000		0.7700	10.8540 (74)		
East				2.1700	19.6403	0.6300	0.7000		0.7700	13.0250 (76)		
West				3.0000	19.6403	0.6300	0.7000		0.7700	18.0070 (80)		
Solar gains	41.8860	81.4477	135.2194	202.4195	254.9545	264.5645	250.3729	210.0652	158.6504	96.7231	52.0831	34.5676 (83)
Total gains	533.7897	569.0660	603.4587	640.9229	663.2897	645.9196	616.0601	583.6499	549.4511	517.4560	505.9231	513.1954 (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	47.5713	47.7777	47.9860	48.7457	48.7457	48.7457	48.7457	48.7457	48.7457	48.7457	48.7457	48.7457	48.4079	
alpha	4.1714	4.1852	4.1991	4.2497	4.2497	4.2497	4.2497	4.2497	4.2497	4.2497	4.2497	4.2497	4.2272	
util living area	0.9750	0.9650	0.9413	0.8820	0.7698	0.6044	0.4542	0.4969	0.7193	0.8999	0.9606	0.9783	(86)	
MIT	19.8478	19.9895	20.2406	20.5673	20.8168	20.9505	20.9883	20.9829	20.8962	20.5885	20.1824	19.8314	(87)	
Th 2	20.0933	20.0969	20.1004	20.1132	20.1132	20.1132	20.1132	20.1132	20.1132	20.1132	20.1132	20.1076	(88)	
util rest of house	0.9699	0.9579	0.9291	0.8574	0.7240	0.5332	0.3669	0.4074	0.6529	0.8737	0.9514	0.9738	(89)	
MIT 2	19.0534	19.1953	19.4426	19.7626	19.9835	20.0865	20.1091	20.1067	20.0509	19.7881	19.3994	19.0488	(90)	
Living area fraction	19.3373	19.4791	19.7278	20.0502	20.2813	20.3953	20.4233	20.4198	20.3530	20.0742	19.6793	19.3285	(92)	
MIT	19.3373	19.4791	19.7278	20.0502	20.2813	20.3953	20.4233	20.4198	20.3530	20.0742	19.6793	19.3285	(93)	
Temperature adjustment														
adjusted MIT	19.3373	19.4791	19.7278	20.0502	20.2813	20.3953	20.4233	20.4198	20.3530	20.0742	19.6793	19.3285	(93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9647	0.9520	0.9232	0.8554	0.7333	0.5566	0.3979	0.4391	0.6720	0.8724	0.9459	0.9690	(94)
Useful gains	514.9529	541.7768	557.0881	548.2579	486.3637	359.5511	245.1491	256.2611	369.2339	451.4386	478.5756	497.2750	(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	1000.6604	965.9801	872.6425	724.1150	557.2853	376.3567	248.2927	261.0552	406.0842	615.2705	816.9215	989.3328	(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	361.3664	285.0646	234.7725	126.6171	52.7657	0.0000	0.0000	0.0000	0.0000	121.8909	243.6091	366.0910	(98)
Space heating													
Space heating per m2													(98) / (4) = 26.6099 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1986.8928 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	361.3664	285.0646	234.7725	126.6171	52.7657	0.0000	0.0000	0.0000	0.0000	121.8909	243.6091	366.0910	(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)	400.6280	316.0361	260.2799	140.3738	58.4985	0.0000	0.0000	0.0000	0.0000	135.1341	270.0766	405.8658	(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	141.7780	123.9514	127.8567	111.4249	106.8730	92.1871	85.4249	98.0648	99.2748	115.7406	126.3894	137.3044	(64)
Efficiency of water heater (217)m	85.7601	85.4427	84.7124	83.0570	80.3206	76.2000	76.2000	76.2000	76.2000	82.7913	84.8733	85.8955	(216)
Fuel for water heating, kWh/month	165.3193	145.0696	150.9303	134.1547	133.0580	120.9805	112.1062	128.6939	130.2820	139.7979	148.9153	159.8504	(219)
Water heating fuel used												1669.1579	(219)
Annual totals kWh/year													
Space heating fuel - main system												1986.8928	(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)												45.9631	(230a)
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												120.9631	(231)
Electricity for lighting (calculated in Appendix L)												330.0466	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.80 * 597 * 1.00) =										-382.3114		-382.3114	(233)
Total delivered energy for all uses												3724.7490	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1986.8928	3.4800	69.1439 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1669.1579	3.4800	58.0867 (247)
Mechanical ventilation fans	45.9631	13.1900	6.0625 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	330.0466	13.1900	43.5331 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-382.3114	13.1900	-50.4269 (252)
Total energy cost			256.2919 (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] = 0.9581 (257)
SAP value	86.6345
SAP rating (Section 12)	87 (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	1986.8928	0.2160	429.1688 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1669.1579	0.2160	360.5381 (264)
Space and water heating			789.7069 (265)
Pumps and fans	120.9631	0.5190	62.7799 (267)
Energy for lighting	330.0466	0.5190	171.2942 (268)
Energy saving/generation technologies			
PV Unit	-382.3114	0.5190	-198.4196 (269)
Total kg/year			825.3614 (272)
CO2 emissions per m2			12.2500 (273)
EI value			90.1559

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

EI rating 90 (274)
EI band B

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	$3.48 / 0.8147 = 4.271$, stars = 4
Water heating environmental impact	$0.216 / 0.8147 = 0.2651$, 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	4.0100 (1b)	x 2.8300 (2b)	= 11.3483 (1b) - (3b)
First floor	63.3400 (1c)	x 2.3200 (2c)	= 146.9488 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	67.3500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 158.2971 (5)

2. Ventilation rate

					main heating	+	secondary heating	+	other	=	total	m3 per hour	
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)	
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)	
Number of intermittent fans											0 * 10 =	0.0000 (7a)	
Number of passive vents											0 * 10 =	0.0000 (7b)	
Number of flueless gas fires											0 * 40 =	0.0000 (7c)	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =												0.0000 / (5) =	0.0000 (8)
Pressure test											Yes		
Measured/design AP50												4.7600	
Infiltration rate												0.2380 (18)	
Number of sides sheltered												1 (19)	
Shelter factor									(20) = 1 - [0.075 x (19)] =			0.9250 (20)	
Infiltration rate adjusted to include shelter factor									(21) = (18) x (20) =			0.2202 (21)	
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000 (22)	
Adj infilt rate	1.1750	1.1000	1.1000	1.0000	1.0250	0.9750	0.9750	0.9500	0.9500	1.0250	1.0000	1.0250 (22a)	
	0.2587	0.2422	0.2422	0.2202	0.2257	0.2146	0.2146	0.2091	0.2091	0.2257	0.2202	0.2257 (22b)	
Mechanical extract ventilation - centralised													
If mechanical ventilation:												0.5000 (23a)	
Effective ac	0.5087	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)			8.5100	1.1450	9.7443		(27)					
Ground Floor			3.9000	0.1200	0.4680	84.0000	327.6000 (28a)					
Brick and Block	6.3000	2.1500	4.1500	0.2500	1.0375	68.2600	283.2790 (29a)					
First Floor	57.2600	8.5100	48.7500	0.2400	11.7000	42.2200	2058.2250 (29a)					
Pitched Roof	63.3400		63.3400	0.1000	6.3340	9.1000	576.3940 (30)					
Total net area of external elements Aum(A, m2)			130.8000				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		31.6488		(33)					
Party Wall 1			21.2600	0.0000	0.0000	58.0600	1234.3556 (32)					
Party Wall 2			20.3500	0.0000	0.0000	58.0600	1181.5210 (32)					
Party Floor 1			59.7400			70.0000	4181.8000 (32d)					
Stud partition			128.4600			9.0000	1156.1400 (32c)					
Internal Floor 1			4.0000			70.0000	280.0000 (32d)					
Internal Ceiling 1			3.9000			30.0000	117.0000 (32e)					
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		11396.3146 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							169.2103 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.1742 (36)					
Total fabric heat loss						(33) + (36) =	38.8229 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 26.5723	Feb 26.1190	Mar 26.1190	Apr 26.1190	May 26.1190	Jun 26.1190	Jul 26.1190	Aug 26.1190	Sep 26.1190	Oct 26.1190	Nov 26.1190	Dec 26.1190 (38)
Heat transfer coeff	65.3952	64.9420	64.9420	64.9420	64.9420	64.9420	64.9420	64.9420	64.9420	64.9420	64.9420	64.9420 (39)
Average = Sum(39)m / 12 =												64.9797 (39)
HLP	Jan 0.9710	Feb 0.9642	Mar 0.9642	Apr 0.9642	May 0.9642	Jun 0.9642	Jul 0.9642	Aug 0.9642	Sep 0.9642	Oct 0.9642	Nov 0.9642	Dec 0.9642 (40)
HLP (average)												0.9648 (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	2.1801 (42)
Average daily hot water use (litres/day)	85.9776 (43)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	94.5754	91.1363	87.6972	84.2581	80.8190	77.3799	77.3799	80.8190	84.2581	87.6972	91.1363	94.5754	(44)
Energy content (annual)	140.2526	122.6658	126.5801	110.3556	105.8888	91.3740	84.6714	97.1617	98.3221	114.5850	125.0785	135.8271	(45)
Distribution loss (46)m = 0.15 x (45)m	21.0379	18.3999	18.9870	16.5533	15.8833	13.7061	12.7007	14.5743	14.7483	17.1877	18.7618	20.3741	(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	1.5254	1.2856	1.2766	1.0693	0.9841	0.8131	0.7535	0.9030	0.9527	1.1556	1.3109	1.4773	(61)
Total heat required for water heating calculated for each month	141.7780	123.9514	127.8567	111.4249	106.8730	92.1871	85.4249	98.0648	99.2748	115.7406	126.3894	137.3044	(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	141.7780	123.9514	127.8567	111.4249	106.8730	92.1871	85.4249	98.0648	99.2748	115.7406	126.3894	137.3044	(64)
Heat gains from water heating, kWh/month	47.0153	41.1078	42.4070	36.9606	35.4541	30.5851	28.3416	32.5320	32.9303	38.3884	41.9163	45.5318	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	130.8066	130.8066	130.8066	130.8066	130.8066	130.8066	130.8066	130.8066	130.8066	130.8066	130.8066	130.8066	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	46.7215	41.4976	33.7481	25.5495	19.0986	16.1238	17.4223	22.6462	30.3957	38.5943	45.0453	48.0200	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	285.1266	288.0853	280.6294	264.7568	244.7203	225.8889	213.3084	210.3496	217.8055	233.6782	253.7147	272.5461	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.2608	50.2608	50.2608	50.2608	50.2608	50.2608	50.2608	50.2608	50.2608	50.2608	50.2608	50.2608	(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)	-87.2044	-87.2044	-87.2044	-87.2044	-87.2044	-87.2044	-87.2044	-87.2044	-87.2044	-87.2044	-87.2044	-87.2044	(71)
Water heating gains (Table 5)	63.1926	61.1723	56.9987	51.3341	47.6533	42.4794	38.0936	43.7258	45.7365	51.5973	58.2171	61.1987	(72)
Total internal gains	491.9037	487.6182	468.2393	438.5034	408.3352	381.3550	365.6873	373.5847	390.8007	420.7329	453.8400	478.6278	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W
North	3.3400	13.4684	0.6300	0.7000	0.7700	13.7479 (74)
East	2.1700	25.1733	0.6300	0.7000	0.7700	16.6944 (76)
West	3.0000	25.1733	0.6300	0.7000	0.7700	23.0798 (80)

Solar gains	53.5221	88.8211	150.2921	225.3591	266.2246	305.1423	277.6709	243.7958	184.4923	113.9099	66.3959	41.7716	(83)
Total gains	545.4258	576.4393	618.5313	663.8624	674.5597	686.4974	643.3582	617.3805	575.2931	534.6427	520.2359	520.3993	(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	48.4079	48.7457	48.7457	48.7457	48.7457	48.7457	48.7457	48.7457	48.7457	48.7457	48.7457	48.7457	
alpha	4.2272	4.2497	4.2497	4.2497	4.2497	4.2497	4.2497	4.2497	4.2497	4.2497	4.2497	4.2497	
util living area	0.9642	0.9531	0.9187	0.8346	0.6859	0.4709	0.3310	0.3344	0.5958	0.8397	0.9385	0.9685	(86)
MIT	20.0575	20.1667	20.4075	20.6982	20.9012	20.9845	20.9974	20.9973	20.9589	20.7468	20.3780	20.0393	(87)
Th 2	20.1076	20.1132	20.1132	20.1132	20.1132	20.1132	20.1132	20.1132	20.1132	20.1132	20.1132	20.1132	(88)
util rest of house	0.9566	0.9433	0.9016	0.8011	0.6278	0.3937	0.2431	0.2429	0.5144	0.7984	0.9235	0.9616	(89)
MIT 2	19.2713	19.3818	19.6130	19.8807	20.0506	20.1067	20.1127	20.1127	20.0933	19.9297	19.5888	19.2585	(90)
Living area fraction	19.5523	19.6623	19.8969	20.1729	20.3546	20.4204	20.4288	20.4289	20.4026	20.2217	19.8709	19.5376	(91)
MIT	19.5523	19.6623	19.8969	20.1729	20.3546	20.4204	20.4288	20.4289	20.4026	20.2217	19.8709	19.5376	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5523	19.6623	19.8969	20.1729	20.3546	20.4204	20.4288	20.4289	20.4026	20.2217	19.8709	19.5376	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9510	0.9375	0.8969	0.8035	0.6444	0.4209	0.2746	0.2757	0.5419	0.8040	0.9187	0.9562	(94)
Useful gains	518.6867	540.3885	554.7710	533.4151	434.6802	288.9662	176.6800	170.1982	311.7580	429.8445	477.9263	497.6124	(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	912.4141	887.2574	798.5874	654.1524	471.1264	293.5642	177.2164	170.7227	324.8814	527.4412	731.9515	898.6390	(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	292.9331	233.0959	181.3994	86.9309	27.1159	0.0000	0.0000	0.0000	0.0000	72.6120	182.8981	298.3638	(98)
Space heating												1375.3491	(98)
Space heating per m2												20.4209	(99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												90.2000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												1524.7772	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	292.9331	233.0959	181.3994	86.9309	27.1159	0.0000	0.0000	0.0000	0.0000	72.6120	182.8981	298.3638	(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)	324.7596	258.4211	201.1080	96.3757	30.0620	0.0000	0.0000	0.0000	0.0000	80.5011	202.7695	330.7802	(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	141.7780	123.9514	127.8567	111.4249	106.8730	92.1871	85.4249	98.0648	99.2748	115.7406	126.3894	137.3044	(64)
Efficiency of water heater (217)m	85.1007	84.7918	83.8322	81.7616	78.6711	76.2000	76.2000	76.2000	76.2000	81.0496	83.9008	85.2630	(216)
Fuel for water heating, kWh/month	166.6003	146.1832	152.5150	136.2802	135.8478	120.9805	112.1062	128.6939	130.2820	142.8021	150.6415	161.0363	(219)
Water heating fuel used												1683.9689	(219)
Annual totals kWh/year													
Space heating fuel - main system												1524.7772	(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)												45.9631	(230a)
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												120.9631	(231)
Electricity for lighting (calculated in Appendix L)												330.0466	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.80 * 696 * 1.00) =										-445.6456		-445.6456	(233)
Total delivered energy for all uses												3214.1103	(238)

10a. Fuel costs - using BEDF prices (542)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1524.7772	7.6100	116.0355 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1683.9689	7.6100	128.1500 (247)
Mechanical ventilation fans	45.9631	31.0800	14.2853 (249)
Pumps and fans for heating	75.0000	31.0800	23.3100 (249)
Energy for lighting	330.0466	31.0800	102.5785 (250)
Additional standing charges			105.0000 (251)
Energy saving/generation technologies			
PV Unit	-445.6456	31.0800	-138.5067 (252)
Total energy cost			350.8527 (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	1524.7772	0.2160	329.3519 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1683.9689	0.2160	363.7373 (264)
Space and water heating			693.0892 (265)
Pumps and fans	120.9631	0.5190	62.7799 (267)
Energy for lighting	330.0466	0.5190	171.2942 (268)
Energy saving/generation technologies			
PV Unit	-445.6456	0.5190	-231.2901 (269)
Total kg/year			695.8731 (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	1524.7772	1.2200	1860.2282 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1683.9689	1.2200	2054.4421 (264)
Space and water heating			3914.6703 (265)
Pumps and fans	120.9631	3.0700	371.3569 (267)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Energy for lighting	330.0466	3.0700	1013.2431 (268)
Energy saving/generation technologies			
PV Unit	-445.6456	3.0700	-1368.1321 (269)
Primary energy kWh/year			3931.1381 (272)
Primary energy kWh/m ² /year			58.3688 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 87
Current environmental impact rating: B 90

(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	Not applicable
O	Not considered
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U Solar photovoltaic panels	Not applicable
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
(none)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
	Total Savings £0		0.00 kg/m ²

Potential energy efficiency rating: B 87
Potential environmental impact rating: B 90

Fuel prices for cost data on this page from database revision number 542 TEST (30 Apr 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	£140	£140	£0
Mains gas	£349	£349	£0
Space heating	£259	£259	£0
Water heating	£128	£128	£0
Lighting	£103	£103	£0
Generated (PV)	-£139	-£139	£0
Total cost of fuels	£350	£350	£0
Total cost of uses	£351	£351	£0
Delivered energy	48 kWh/m ²	48 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	0.7 tonnes	0.7 tonnes	0.0 tonnes
CO2 emissions per m ²	10 kg/m ²	10 kg/m ²	0 kg/m ²
Primary energy	58 kWh/m ²	58 kWh/m ²	0 kWh/m ²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

No improvements selected / applicable

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

No improvements selected / applicable

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0943 plot 23	Issued on Date	24/05/2024
Assessment Reference	As Built	Prop Type Ref	Block J
Project	20, Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	87 B	DER	14.24	TER	19.01
Environmental	90 B	% DER<TER	25.11		
CO ₂ Emissions (t/year)	0.70	DFEE	40.97	TFEE	49.58
General Requirements Compliance	Pass	% DFEE<TFEE	17.38		

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 23	Issued on Date	24/05/2024
Assessment Reference	As Built	Prop Type Ref	Block J
Project	20, Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	87 B	DER	14.24	TER	19.01
Environmental	90 B	% DER<TER	25.11		
CO ₂ Emissions (t/year)	0.70	DFEE	40.97	TFEE	49.58
General Requirements Compliance	Pass	% DFEE<TFEE	17.38		

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	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 4	Supabloc *7						
	Main construction	100	0.1900	0.5263	94.04	680	1000
	Main construction	100	0.8803	0.1136	5.96	680	1000
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 5	Plasterboard, standard						
	Main construction	12.5	0.2100	0.0595	100.00	700	1000
Int surface				0.1300			

Total resistance:	Upper limit = 3.968 m ² K/W	Lower limit = 3.901 m ² K/W	Average = 3.935 m ² K/W
	Total correction = 0.0001 m ² K/W	U-value (unrounded) = 0.25 W/m ² K	

Unheated space: None		
Total thickness: 330 mm	U-value: 0.25 W/m² K	Kappa: 68.26 kJ/m² K

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0943 plot 23	Issued on Date	24/05/2024
Assessment Reference	As Built	Prop Type Ref	Block J
Project	20, Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	87 B	DER	14.24	TER	19.01
Environmental	90 B	% DER<TER	25.11		
CO ₂ Emissions (t/year)	0.70	DFEE	40.97	TFEE	49.58
General Requirements Compliance	Pass	% DFEE<TFEE	17.38		

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 000004

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 23	Issued on Date	24/05/2024
Assessment Reference	As Built	Prop Type Ref	Block J
Project	20, Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	87 B	DER	14.24	TER	19.01
Environmental	90 B	% DER<TER	25.11		
CO ₂ Emissions (t/year)	0.70	DFEE	40.97	TFEE	49.58
General Requirements Compliance	Pass	% DFEE<TFEE	17.38		

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

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 23			Issued on Date	24/05/2024
Assessment Reference	As Built	Prop Type Ref	Block J		
Property	20, Shaw Crescent, West End, Southampton, SO30 3LH				
SAP Rating	87 B	DER	14.24	TER	19.01
Environmental	90 B	% DER<TER	25.11		
CO ₂ Emissions (t/year)	0.70	DFEE	40.97	TFEE	49.58
General Requirements Compliance	Pass	% DFEE<TFEE	17.38		
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	East
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Suburban
1.0 Property Type	Maisonette, Semi-Detached
2.0 Number of Storeys	2
3.0 Date Built	2023
4.0 Sheltered Sides	1
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements		Heat Loss Perimeter	Internal Floor Area	Average Storey Height
	Ground Floor:	2.25 m	4.01 m ²	2.83 m
	1st Storey:	24.65 m	63.34 m ²	2.32 m

7.0 Living Area	24.07	m ²
8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	169.21	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		0.25	68.26	6.30	4.15
First Floor	Cavity Wall	Other		0.24	42.22	57.26	48.75

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	Other		0.00	58.06	21.26
Party Wall 2	Filled Cavity with Edge Sealing	Other		0.00	58.06	20.35

9.2 Internal Walls				Kappa (kJ/m ² K)	Area (m ²)
Description	Construction				
Stud partition	Plasterboard on timber frame			9.00	128.46

10.0 External Roofs

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Description		Type	Construction				U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area (m²)	Nett Area (m²)	
Pitched Roof		External Plane Roof	Other				0.10	9.10	63.34	63.34	
10.2 Internal Ceilings											
Description		Construction							Kappa (kJ/m²K)	Area (m²)	
Internal Ceiling 1		Other							30.00	3.90	
11.0 Heat Loss Floors											
Description		Type	Construction				U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)		
Ground Floor		Ground Floor - Solid	Other				0.12	84.00	3.90		
11.1 Party Floors											
Description		Construction							Kappa (kJ/m²K)	Area (m²)	
Party Floor 1		Precast concrete plank floor (screed laid on rubber), carpeted							70.00	59.74	
11.2 Internal Floors											
Description		Construction							Kappa (kJ/m²K)	Area (m²)	
Internal Floor 1		Other							70.00	4.00	
12.0 Opening Types											
Description		Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m²K)	
Front Door		Manufacturer	Solid Door							1.10	
Windows		Manufacturer	Window	Double Low-E Soft 0.1			0.63		0.70	1.20	
13.0 Openings											
Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
Front Door	Solid Door	[1] Brick and Block	East							2.15	
Front Elevation	Window	[2] First Floor	East	None	0.00					2.17	
Side Elevation	Window	[2] First Floor	North	None	0.00					3.34	
Rear Elevation	Window	[2] First Floor	West	None	0.00					3.00	
14.0 Conservatory											
15.0 Draught Proofing			%								
16.0 Draught Lobby											
17.0 Thermal Bridging											
17.1 List of Bridges											

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Source Type	Bridge Type	Length	Psi	Imported	Reference:
Independently assessed	E2 Other lintels (including other steel lintels)	0.69	0.077	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	1.02	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)	1.81	0.061	No	Birtley Supatherm
Independently assessed	E3 Sill	7.49	0.021	No	Knauf P5
Independently assessed	E4 Jamb	17.70	0.016	No	Knauf P6
Table K1 - Default	E5 Ground floor (normal)	2.23	0.320	No	
Table K1 - Approved	E7 Party floor between dwellings (in blocks of flats)	22.03	0.070	No	
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	12.77	0.060	No	
Independently assessed	E12 Gable (insulation at ceiling level)	11.80	0.044	No	Knauf P21
Independently assessed	E16 Corner (normal)	9.29	0.039	No	Knauf P23
Independently assessed	E16 Corner (normal)	2.82	0.048	No	Knauf P23
Independently assessed	E18 Party wall between dwellings	2.40	0.026	No	Knauf P25/3
Independently assessed	E18 Party wall between dwellings	2.40	0.040	No	Knauf P25 Halved
Independently assessed	E25 Staggered party wall between dwellings	7.54	0.062	No	Knauf P27 Halved
Table K1 - Default	P1 Party wall - Ground floor	7.54	0.160	No	
Table K1 - Default	P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.66	0.000	No	
Independently assessed	P4 Party wall - Roof (insulation at ceiling level)	8.78	0.035	No	Knauf P29 Halved

Y-value	0.055	W/m ² K
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18.0 Pressure Testing	Yes	
Designed AP ₅₀	5.00	m ³ /(h.m ²) @ 50 Pa
Property Tested ?	Yes	
As Built AP ₅₀	4.76	m ³ /(h.m ²) @ 50 Pa

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	1
Manufacturer SFP	0.17
Duct Type	Rigid
Wet Rooms	1

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
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22.0 Lighting

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Internal

Total number of light fittings	15	
Total number of L.E.L. fittings	15	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted	Yes
Light and motion sensor	Yes

23.0 Electricity Tariff	Standard
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24.0 Main Heating 1	Database	
Description	Gas Combi	
Percentage of Heat	100	%
Database Ref. No.	17959	
Fuel Type	Mains gas	
Main Heating	BGW	
SAP Code	104	
In Winter	90.2	
In Summer	76.2	
Controls	CBE Programmer, room thermostat and TRVs	
PCDF Controls	0	
Delayed Start Stat	No	
Sap Code	2106	
Flue Type	Balanced	
Fan Assisted Flue	Yes	
Is MHS Pumped	Pump in heated space	
Heat Emitter	Radiators	
Flow Temperature	Normal (> 45°C)	
Combi boiler type	Standard Combi	
Combi keep hot type	None	

25.0 Main Heating 2	None
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Community Heating	None
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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
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SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

PV Cells kWp
0.80

Orientation
North

Elevation
45°

Overshading
None Or Little

Connected to Dwelling
Yes

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None