



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 4 Haines Crescent, West End
Southampton, SO30 3LG

Contact: Tobias Whiting
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Report Issue Date: 29/03/2022

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0647 Plot 83				Issued on Date	29/03/2022
Assessment Reference	As Built	Prop Type Ref	D (HA/AR)			
Property	4 Haines Crescent, West End, Southampton, SO30 3LG					
SAP Rating	87 B	DER	14.52	TER	19.08	
Environmental	90 B	% DER<TER	23.89			
CO ₂ Emissions (t/year)	0.75	DFEE	44.43	TFEE	52.71	
General Requirements Compliance	Pass	% DFEE<TFEE	15.71			
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.com				Assessor ID	E477-0001
Client	Foreman Homes, FORE					

SUMMARY FOR INPUT DATA FOR New Build (As Built)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	19.08	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.52	kgCO ₂ /m ²	Pass
	-4.56 (-23.9%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	52.71	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	44.43	kWh/m ² /yr	
	-8.3 (-15.7%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

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

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.12 (measured in this dwelling)	m ³ /(h.m ²) @ 50 Pa	
Maximum	10.0	m ³ /(h.m ²) @ 50 Pa	Pass

Limiting System Efficiencies

4 Heating efficiency

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

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Main heating system

Boiler system with radiators or underfloor - Mains gas
Data from database
Worcester Greenstar 30Si Compact ErP
Combi boiler
Efficiency: 89.8% SEDBUK2009
Minimum: 88.0%

Pass

Secondary heating system

None

5 Cylinder insulation

Hot water storage

No cylinder

6 Controls

Space heating controls

Programmer, room thermostat and TRVs

Pass

Hot water controls

No cylinder

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100 %

Minimum

75 %

Pass

8 Mechanical ventilation

Continuous extract system

Specific fan power

0.30

Maximum

0.7

Pass

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Southern England)

Slight

Pass

Based on:

Overshading

Average

Windows facing North East

3.43 m², No overhang

Windows facing South East

1.32 m², No overhang

Windows facing South West

7.49 m², No overhang

Air change rate

4.00 ach

Blinds/curtains

None

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

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

Maximum

10.0 m³/(h.m²) @ 50 Pa

Pass

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BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

10 Key features

Party wall U-value	0.00	W/m ² K
Roof U-value	0.10	W/m ² K
Floor U-value	0.12	W/m ² K
Door U-value	1.10	W/m ² K
Photovoltaic array	0.64	kW

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THERMAL BRIDGING

Calculation Type: New Build (As Built)

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Property	4 Haines Crescent, West End, Southampton, SO30 3LG		

SAP Rating	87 B	DER	14.52	TER	19.08
Environmental	90 B	% DER<TER	23.89		
CO ₂ Emissions (t/year)	0.75	DFEE	44.43	TFEE	52.71
General Requirements Compliance	Pass	% DFEE<TFEE	15.71		

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Client	Foreman Homes, FORE
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	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.053	10.13	0.54	CD0025
External wall	E3 Sill	Independently assessed	0.034	7.61	0.26	CD0027
External wall	E4 Jamb	Independently assessed	0.039	27.03	1.05	CD0028
External wall	E5 Ground floor (normal)	Independently assessed	0.060	16.79	1.01	CBA-302
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.000	16.79	0.00	CD0029
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	8.40	0.50	
External wall	E12 Gable (insulation at ceiling level)	Independently assessed	0.054	8.50	0.46	CD0031
External wall	E16 Corner (normal)	Independently assessed	0.050	10.10	0.51	CD0035
External wall	E18 Party wall between dwellings	Table K1 - Approved	0.060	10.10	0.61	
Party wall	P1 Party wall - Ground floor	Table K1 - Default	0.160	8.50	1.36	
Party wall	P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	0.000	8.50	0.00	
Party wall	P4 Party wall - Roof (insulation at ceiling level)	Table K1 - Default	0.240	8.50	2.04	

Total: **8.33** W/mK:
Y-Value: **0.054** W/m²K:

FULL SAP CALCULATION PRINTOUT

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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 House, total floor area 70 m²

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

1a TER and DER

Fuel for main heating:Mains gas

Fuel factor:1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 19.08 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 14.52 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 52.7 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE) 44.4 kWh/m²/yrOK

2 Fabric U-values

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

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	4.12 (measured in this dwelling)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas

Data from database

Worcester Greenstar 30Si Compact ErP

Combi boiler

Efficiency: 89.8% SEDBUK2009

Minimum: 88.0% OK

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Programmer, room thermostat and TRVs OK

Hot water controls:

No cylinder

Boiler interlock

Yes

OK

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous extract system

Specific fan power:	0.30	
Maximum	0.7	OK

9 Summertime temperature

Overheating risk (Southern England): Slight OK

Based on:

Overshading:	Average
Windows facing North East:	3.43 m ² , No overhang
Windows facing South East:	1.32 m ² , No overhang
Windows facing South West:	7.49 m ² , No overhang
Air change rate:	4.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Roof U-value	0.10 W/m ² K
Floor U-value	0.12 W/m ² K
Door U-value	1.10 W/m ² K
Photovoltaic array	0.64 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	35.1100 (1b)	x 2.3900 (2b)	= 83.9129 (1b) - (3b)
First floor	35.1100 (1c)	x 2.6700 (2c)	= 93.7437 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.2200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 177.6566 (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											4.1200	
Infiltration rate											0.2060 (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) =	0.1906 (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												
	0.2430	0.2382	0.2334	0.2096	0.2048	0.1810	0.1810	0.1763	0.1906	0.2048	0.2144	0.2239 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			12.2400	1.1450	14.0153		(27)
Ground Floor			35.1100	0.1200	4.2132	84.0000	2949.2400 (28a)
Brick and Block	84.9600	14.3600	70.6000	0.2400	16.9440	42.2200	2980.7320 (29a)
Pitched Roof	35.1100		35.1100	0.1000	3.5110	9.1000	319.5010 (30)
Total net area of external elements Aum(A, m ²)			155.1800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.0155		(33)
Party Wall 1			42.9200	0.0000	0.0000	70.0000	3004.4000 (32)
GF Stud			60.0000			9.0000	540.0000 (32c)
First Floor			75.1900			9.0000	676.7100 (32c)
Internal Floor 1			35.1100			18.0000	631.9800 (32d)
Internal Ceiling 1			35.1100			18.0000	631.9800 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	11734.5430 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							167.1111 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.3312 (36)
Total fabric heat loss						(33) + (36) =	49.3467 (37)

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

(38)m	Jan 29.3133	Feb 29.3133	Mar 29.3133	Apr 29.3133	May 29.3133	Jun 29.3133	Jul 29.3133	Aug 29.3133	Sep 29.3133	Oct 29.3133	Nov 29.3133	Dec 29.3133 (38)
Heat transfer coeff	78.6600	78.6600	78.6600	78.6600	78.6600	78.6600	78.6600	78.6600	78.6600	78.6600	78.6600	78.6600 (39)
Average = Sum(39)m / 12 =												78.6600 (39)
HLP	Jan 1.1202	Feb 1.1202	Mar 1.1202	Apr 1.1202	May 1.1202	Jun 1.1202	Jul 1.1202	Aug 1.1202	Sep 1.1202	Oct 1.1202	Nov 1.1202	Dec 1.1202 (40)
HLP (average)												1.1202 (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	2.2515 (42)
Average daily hot water use (litres/day)	87.6720 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use											

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy conte	96.4392	92.9324	89.4255	85.9186	82.4117	78.9048	78.9048	82.4117	85.9186	89.4255	92.9324	96.4392 (44)
Energy content (annual)	143.0166	125.0832	129.0747	112.5304	107.9756	93.1748	86.3401	99.0766	100.2598	116.8432	127.5435	138.5039 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum (45)m =		1379.4225 (45)
	21.4525	18.7625	19.3612	16.8796	16.1963	13.9762	12.9510	14.8615	15.0390	17.5265	19.1315	20.7756 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	31.2121	28.1758	31.1694	30.1354	31.1192	30.0914	31.0795	31.1052	30.1154	31.1486	30.1769	31.2039 (61)
Total heat required for water heating calculated for each month	174.2288	153.2590	160.2441	142.6658	139.0948	123.2662	117.4197	130.1818	130.3752	147.9918	157.7204	169.7078 (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	174.2288	153.2590	160.2441	142.6658	139.0948	123.2662	117.4197	130.1818	130.3752	147.9918	157.7204	169.7078 (64)
Heat gains from water heating, kWh/month	55.3561	48.6341	50.7097	44.9502	43.6817	38.5035	36.4780	40.7193	40.8652	46.6375	49.9524	53.8535 (65)
										Solar input (sum of months) = Sum(63)m =		0.0000 (63)
										Total per year (kWh/year) = Sum(64)m =		1746.1553 (64)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	112.5727	112.5727	112.5727	112.5727	112.5727	112.5727	112.5727	112.5727	112.5727	112.5727	112.5727	112.5727 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	18.1079	16.0832	13.0798	9.9022	7.4020	6.2491	6.7524	8.7770	11.7805	14.9580	17.4582	18.6111 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	197.8100	199.8626	194.6900	183.6782	169.7776	156.7131	147.9852	145.9326	151.1052	162.1171	176.0176	189.0821 (68)
Pumps, fans	34.2573	34.2573	34.2573	34.2573	34.2573	34.2573	34.2573	34.2573	34.2573	34.2573	34.2573	34.2573 (69)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (Table 5)	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582 (71)
Total internal gains	74.4033	72.3722	68.1582	62.4309	58.7120	53.4770	49.0295	54.7302	56.7573	62.6848	69.3784	72.3838 (72)
	350.0930	348.0899	335.6998	315.7831	295.6634	276.2111	263.5390	269.2116	279.4147	299.5317	322.6260	339.8488 (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			
Northeast				3.4300	11.2829	0.6300	0.7000	0.7700	11.8274 (75)			
Southeast				1.3200	36.7938	0.6300	0.7000	0.7700	14.8430 (77)			
Southwest				7.4900	36.7938	0.6300	0.7000	0.7700	84.2226 (79)			
Solar gains	110.8929	192.8203	274.2601	357.3122	416.1842	420.1968	402.1922	357.1976	302.8529	215.9210	133.5396	94.4383 (83)
Total gains	460.9859	540.9102	609.9599	673.0953	711.8476	696.4079	665.7312	626.4091	582.2677	515.4527	456.1656	434.2871 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	41.4390	41.4390	41.4390	41.4390	41.4390	41.4390	41.4390	41.4390	41.4390	41.4390	41.4390	41.4390
util living area	3.7626	3.7626	3.7626	3.7626	3.7626	3.7626	3.7626	3.7626	3.7626	3.7626	3.7626	3.7626
	0.9873	0.9763	0.9535	0.9016	0.8007	0.6478	0.4976	0.5442	0.7614	0.9268	0.9779	0.9898 (86)
MIT	19.4324	19.6518	19.9793	20.3702	20.7050	20.9045	20.9729	20.9618	20.8185	20.3786	19.8181	19.3719 (87)
Th 2	19.9844	19.9844	19.9844	19.9844	19.9844	19.9844	19.9844	19.9844	19.9844	19.9844	19.9844	19.9844 (88)
util rest of house	0.9844	0.9710	0.9429	0.8784	0.7538	0.5677	0.3922	0.4375	0.6915	0.9046	0.9721	0.9874 (89)
MIT 2	18.5603	18.7768	19.0978	19.4720	19.7743	19.9329	19.9750	19.9700	19.8744	19.4879	18.9435	18.5003 (90)
Living area fraction	18.7543	18.9715	19.2939	19.6718	19.9813	20.1490	20.1970	20.1906	fLA = Living area / (4) =	19.0844	19.6861	19.1380
MIT	18.7543	18.9715	19.2939	19.6718	19.9813	20.1490	20.1970	20.1906	20.0844	19.6861	19.1380	18.6942 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7543	18.9715	19.2939	19.6718	19.9813	20.1490	20.1970	20.1906	20.0844	19.6861	19.1380	18.6942 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9798	0.9643	0.9341	0.8701	0.7536	0.5815	0.4151	0.4603	0.6992	0.8967	0.9657	0.9834 (94)
Ext temp.	451.6826	521.5749	569.7382	585.6785	536.4785	404.9940	276.3216	288.3172	407.1121	462.2111	440.5401	427.0967 (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	1136.9728	1106.8611	1006.3669	847.3073	651.4075	436.4870	282.9374	298.1711	470.7359	714.7093	946.9122	1140.1108 (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	509.8559	393.3124	324.8517	188.3727	85.5072	0.0000	0.0000	0.0000	0.0000	187.8587	364.5879	530.4825 (98)
Space heating per m2												2584.8290 (98)
										(98) / (4) =		36.8104 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)											
Fraction of space heat from main system(s)	1.0000 (202)											
Efficiency of main space heating system 1 (in %)	90.7000 (206)											
Efficiency of secondary/supplementary heating system, %	0.0000 (208)											
Space heating requirement	2849.8666 (211)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	509.8559	393.3124	324.8517	188.3727	85.5072	0.0000	0.0000	0.0000	0.0000	187.8587	364.5879	530.4825 (98)
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000 (210)
Space heating fuel (main heating system)	562.1344	433.6410	358.1606	207.6877	94.2747	0.0000	0.0000	0.0000	0.0000	207.1210	401.9713	584.8760 (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	174.2288	153.2590	160.2441	142.6658	139.0948	123.2662	117.4197	130.1818	130.3752	147.9918	157.7204	169.7078 (64)
Efficiency of water heater (217)m	89.7281	89.6311	89.4434	89.0675	88.3725	87.0000	87.0000	87.0000	87.0000	89.0315	89.5500	87.0000 (216)
Fuel for water heating, kWh/month	194.1741	170.9886	179.1569	160.1772	157.3961	141.6852	134.9651	149.6342	149.8566	166.2240	176.1255	189.0376 (219)
Water heating fuel used												1969.4212 (219)
Annual totals kWh/year												
Space heating fuel - main system												2849.8666 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.4200)												
mechanical ventilation fans (SFP = 0.4200)												91.0312 (230a)
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												166.0312 (231)
Electricity for lighting (calculated in Appendix L)												319.7904 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV Unit 0 (0.80 + 0.64 + 1029 + 1.00) =												-526.9436 (233)
Total delivered energy for all uses												4778.1659 (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	2849.8666	0.2160	615.5712 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1969.4212	0.2160	425.3950 (264)
Space and water heating			1040.9662 (265)
Pumps and fans	166.0312	0.5190	86.1702 (267)
Energy for lighting	319.7904	0.5190	165.9712 (268)
Energy saving/generation technologies			
PV Unit	-526.9436	0.5190	-273.4837 (269)
Total CO2, kg/year			1019.6239 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			14.5200 (273)

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

DER	14.5200	ZC1
Total Floor Area	70.2200	TFA
Assumed number of occupants	2.2515	N
CO2 emission factor in Table 12 for electricity displaced from grid	0.5190	EF
CO2 emissions from appliances, equation (L14)	16.6930	ZC2
CO2 emissions from cooking, equation (L16)	2.4642	ZC3
Total CO2 emissions	33.6772	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	33.6772	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	35.1100 (1b)	x 2.3900 (2b)	= 83.9129 (1b) - (3b)
First floor	35.1100 (1c)	x 2.6700 (2c)	= 93.7437 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.2200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 177.6566 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					30.0000 / (5) = 0.1689 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4189 (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) =	0.3875 (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	0.4940	0.4843	0.4746	0.4262	0.4165	0.3681	0.3681	0.3584	0.3875	0.4165	0.4359	0.4553 (22b)
Effective ac	0.6220	0.6173	0.6126	0.5908	0.5867	0.5677	0.5677	0.5642	0.5751	0.5867	0.5950	0.6036 (25)

3. Heat losses and heat loss parameter

Element	Gross m2			Openings m2		NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K		
TER Opaque door						2.1200	1.0000	2.1200		(26)		
TER Opening Type (Uw = 1.40)						12.2400	1.3258	16.2273		(27)		
Ground Floor						35.1100	0.1300	4.5643		(28a)		
Brick and Block	84.9600			14.3600		70.6000	0.1800	12.7080		(29a)		
Pitched Roof	35.1100					35.1100	0.1300	4.5643		(30)		
Total net area of external elements Aum(A, m2)						155.1800				(31)		
Fabric heat loss, W/K = Sum (A x U)							(26)...(30) + (32) =	40.1839		(33)		
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K											250.0000 (35)	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)											9.1539 (36)	
Total fabric heat loss										(33) + (36) =	49.3378 (37)	
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	36.4668	36.1890	35.9168	34.6379	34.3986	33.2847	33.2847	33.0785	33.7138	34.3986	34.8827	35.3887 (38)
	85.8046	85.5268	85.2545	83.9757	83.7364	82.6225	82.6225	82.4162	83.0516	83.7364	84.2204	84.7265 (39)
Average = Sum(39)m / 12 =												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2219	1.2180	1.2141	1.1959	1.1925	1.1766	1.1766	1.1737	1.1827	1.1925	1.1994	1.2066 (40)
HLP (average)												
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												2.2515 (42)
Average daily hot water use (litres/day)												87.6720 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.4392	92.9324	89.4255	85.9186	82.4117	78.9048	78.9048	82.4117	85.9186	89.4255	92.9324	96.4392 (44)
Energy conte	143.0166	125.0832	129.0747	112.5304	107.9756	93.1748	86.3401	99.0766	100.2598	116.8432	127.5435	138.5039 (45)
Energy content (annual)											Total = Sum(45)m =	1379.4225 (45)
Distribution loss	(46)m = 0.15 x (45)m											
	21.4525	18.7625	19.3612	16.8796	16.1963	13.9762	12.9510	14.8615	15.0390	17.5265	19.1315	20.7756 (46)
Water storage loss:												
Total storage loss												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Total heat required for water heating calculated for each month	49.1444	42.7743	45.5702	42.3708	41.9961	38.9120	40.2090	41.9961	42.3708	45.5702	45.8297	49.1444 (61)
Solar input	192.1610	167.8576	174.6449	154.9013	149.9718	132.0867	126.5492	141.0727	142.6307	162.4134	173.3731	187.6483 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	192.1610	167.8576	174.6449	154.9013	149.9718	132.0867	126.5492	141.0727	142.6307	162.4134	173.3731	187.6483 (64)
	59.8391	52.2838	54.3099	48.0091	46.4009	40.7086	38.7604	43.4420	43.9291	50.2429	53.8656	58.3387 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	112.5727	112.5727	112.5727	112.5727	112.5727	112.5727	112.5727	112.5727	112.5727	112.5727	112.5727	112.5727	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.1079	16.0832	13.0798	9.9022	7.4020	6.2491	6.7524	8.7770	11.7805	14.9580	17.4582	18.6111	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	197.8100	199.8626	194.6900	183.6782	169.7776	156.7131	147.9852	145.9326	151.1052	162.1171	176.0176	189.0821	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2573	34.2573	34.2573	34.2573	34.2573	34.2573	34.2573	34.2573	34.2573	34.2573	34.2573	34.2573	(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)	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	(71)
Water heating gains (Table 5)	80.4289	77.8032	72.9972	66.6793	62.3668	56.5397	52.0972	58.3898	61.0126	67.5308	74.8134	78.4122	(72)
Total internal gains	356.1186	353.5209	340.5388	320.0315	299.3183	279.2738	266.6067	272.8711	283.6701	304.3777	328.0609	345.8772	(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			
Northeast				3.4300	11.2829	0.6300	0.7000	0.7700	11.8274 (75)			
Southeast				1.3200	36.7938	0.6300	0.7000	0.7700	14.8430 (77)			
Southwest				7.4900	36.7938	0.6300	0.7000	0.7700	84.2226 (79)			
Solar gains	110.8929	192.8203	274.2601	357.3122	416.1842	420.1968	402.1922	357.1976	302.8529	215.9210	133.5396	94.4383 (83)
Total gains	467.0115	546.3412	614.7989	677.3437	715.5025	699.4706	668.7989	630.0687	586.5230	520.2987	461.6006	440.3155 (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	56.8313	57.0159	57.1980	58.0691	58.2350	59.0201	59.0201	59.1678	58.7152	58.2350	57.9003	57.5545	
alpha	4.7888	4.8011	4.8132	4.8713	4.8823	4.9347	4.9347	4.9445	4.9143	4.8823	4.8600	4.8370	
util living area	0.9969	0.9928	0.9823	0.9491	0.8631	0.6987	0.5310	0.5813	0.8211	0.9658	0.9934	0.9976	(86)
MIT	19.7229	19.8975	20.1641	20.5049	20.7861	20.9467	20.9888	20.9828	20.8784	20.5111	20.0561	19.6972	(87)
Th 2	19.9025	19.9056	19.9087	19.9233	19.9260	19.9387	19.9387	19.9411	19.9338	19.9260	19.9205	19.9147	(88)
util rest of house	0.9958	0.9904	0.9760	0.9303	0.8138	0.6050	0.4094	0.4576	0.7431	0.9494	0.9907	0.9968	(89)
MIT 2	18.2131	18.4694	18.8571	19.3491	19.7190	19.9038	19.9347	19.9342	19.8391	19.3682	18.7121	18.1842	(90)
Living area fraction	18.5489	18.7870	19.1478	19.6062	19.9564	20.1358	20.1692	20.1675	20.0703	19.6224	19.0111	18.5207	(91)
MIT	18.5489	18.7870	19.1478	19.6062	19.9564	20.1358	20.1692	20.1675	20.0703	19.6224	19.0111	18.5207	(92)
Temperature adjustment	18.5489	18.7870	19.1478	19.6062	19.9564	20.1358	20.1692	20.1675	20.0703	19.6224	19.0111	18.5207	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	464.1245	539.1708	596.4120	625.4543	583.4521	436.2245	291.9747	305.6701	442.5062	490.7917	455.8084	438.2271	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1222.6245	1187.7149	1078.2858	899.0599	691.3572	457.3825	294.8962	310.5028	495.8392	755.5070	1003.1541	1213.3462	(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	564.3241	435.8217	358.5141	196.9960	80.2814	0.0000	0.0000	0.0000	0.0000	196.9482	394.0889	576.6886	(98)
Space heating												2803.6628	(98)
Space heating per m2												39.9268	(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												3001.7803 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	564.3241	435.8217	358.5141	196.9960	80.2814	0.0000	0.0000	0.0000	0.0000	196.9482	394.0889	576.6886 (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)	604.2013	466.6185	383.8480	210.9165	85.9544	0.0000	0.0000	0.0000	0.0000	210.8653	421.9367	617.4396 (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	192.1610	167.8576	174.6449	154.9013	149.9718	132.0867	126.5492	141.0727	142.6307	162.4134	173.3731	187.6483 (64)
Efficiency of water heater (217)m	87.6011	87.3452	86.8228	85.6575	83.5549	80.3000	80.3000	80.3000	80.3000	85.5376	87.0546	80.3000 (216)
Fuel for water heating, kWh/month	219.3590	192.1772	201.1509	180.8380	179.4889	164.4916	157.5955	175.6820	177.6222	189.8738	199.1544	213.9853 (219)
Water heating fuel used												2251.4188 (219)
Annual totals kWh/year												
Space heating fuel - main system												3001.7803 (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)												319.7904 (232)
Total delivered energy for all uses												5647.9896 (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	3001.7803	0.2160	648.3846 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2251.4188	0.2160	486.3065 (264)
Space and water heating			1134.6910 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	319.7904	0.5190	165.9712 (268)
Total CO2, kg/m2/year			1339.5873 (272)
Emissions per m2 for space and water heating			16.1591 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3636 (272b)
Emissions per m2 for pumps and fans			0.5543 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.1591 * 1.00) + 2.3636 + 0.5543, rounded to 2 d.p.			19.0800 (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	35.1100 (1b)	x 2.3900 (2b)	= 83.9129 (1b) - (3b)
First floor	35.1100 (1c)	x 2.6700 (2c)	= 93.7437 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.2200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 177.6566 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1689 (8)
Pressure test					Yes
Measured/design AP50					4.1200
Infiltration rate					0.3749 (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) =	0.3468 (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	0.4421	0.4334	0.4248	0.3814	0.3728	0.3294	0.3294	0.3207	0.3468	0.3728	0.3901	0.4074 (22b)
Effective ac	0.5977	0.5939	0.5902	0.5727	0.5695	0.5543	0.5543	0.5514	0.5601	0.5695	0.5761	0.5830 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			12.2400	1.1450	14.0153		(27)
Ground Floor			35.1100	0.1200	4.2132	84.0000	2949.2400 (28a)
Brick and Block	84.9600	14.3600	70.6000	0.2400	16.9440	42.2200	2980.7320 (29a)
Pitched Roof	35.1100		35.1100	0.1000	3.5110	9.1000	319.5010 (30)
Total net area of external elements Aum(A, m ²)			155.1800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.0155		(33)
Party Wall 1			42.9200	0.0000	0.0000	70.0000	3004.4000 (32)
GF Stud			60.0000			9.0000	540.0000 (32c)
First Floor			75.1900			9.0000	676.7100 (32c)
Internal Floor 1			35.1100			18.0000	631.9800 (32d)
Internal Ceiling 1			35.1100			9.0000	315.9900 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss
(28)...(30) + (32) + (32a)...(32e) = 11418.5530 (34)
162.6111 (35)
8.3312 (36)
(33) + (36) = 49.3467 (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	35.0429	34.8204	34.6023	33.5780	33.3864	32.4942	32.4942	32.3290	32.8378	33.3864	33.7740	34.1794 (38)
Heat transfer coeff	84.3895	84.1671	83.9490	82.9247	82.7330	81.8409	81.8409	81.6757	82.1845	82.7330	83.1207	83.5260 (39)
Average = Sum(39)m / 12 =												82.9237 (39)
HLP	1.2018	1.1986	1.1955	1.1809	1.1782	1.1655	1.1655	1.1631	1.1704	1.1782	1.1837	1.1895 (40)
HLP (average)												1.1809 (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												2.2515 (42)
Average daily hot water use (litres/day)												87.6720 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	96.4392	92.9324	89.4255	85.9186	82.4117	78.9048	78.9048	82.4117	85.9186	89.4255	92.9324	96.4392 (44)
Energy conte	143.0166	125.0832	129.0747	112.5304	107.9756	93.1748	86.3401	99.0766	100.2598	116.8432	127.5435	138.5039 (45)
Energy content (annual)										Total = Sum(45)m =		1379.4225 (45)

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Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	30.3910	26.5802	27.4284	23.9127	22.9448	19.7996	18.3473	21.0538	21.3052	24.8292	27.1030	29.4321 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	112.5727	112.5727	112.5727	112.5727	112.5727	112.5727	112.5727	112.5727	112.5727	112.5727	112.5727	112.5727	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.1079	16.0832	13.0798	9.9022	7.4020	6.2491	6.7524	8.7770	11.7805	14.9580	17.4582	18.6111	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	197.8100	199.8626	194.6900	183.6782	169.7776	156.7131	147.9852	145.9326	151.1052	162.1171	176.0176	189.0821	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2573	34.2573	34.2573	34.2573	34.2573	34.2573	34.2573	34.2573	34.2573	34.2573	34.2573	34.2573	(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)	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	(71)
Water heating gains (Table 5)	40.8482	39.5539	36.8661	33.2121	30.8398	27.4995	24.6603	28.2981	29.5906	33.3725	37.6430	39.5593	(72)
Total internal gains	313.5378	312.2715	301.4077	283.5643	264.7913	247.2335	236.1697	239.7795	249.2480	267.2194	287.8906	304.0243	(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
Northeast				3.4300	11.2829	0.6300	0.7000				0.7700	11.8274 (75)
Southeast				1.3200	36.7938	0.6300	0.7000				0.7700	14.8430 (77)
Southwest				7.4900	36.7938	0.6300	0.7000				0.7700	84.2226 (79)
Solar gains	110.8929	192.8203	274.2601	357.3122	416.1842	420.1968	402.1922	357.1976	302.8529	215.9210	133.5396	94.4383 (83)
Total gains	424.4308	505.0918	575.6678	640.8766	680.9755	667.4304	638.3620	596.9770	552.1010	483.1405	421.4302	398.4626 (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	37.5855	37.6848	37.7827	38.2494	38.3380	38.7559	38.7559	38.8343	38.5939	38.3380	38.1592	37.9740	
alpha	3.5057	3.5123	3.5188	3.5500	3.5559	3.5837	3.5837	3.5890	3.5729	3.5559	3.5439	3.5316	
util living area	0.9895	0.9802	0.9609	0.9154	0.8255	0.6791	0.5300	0.5791	0.7917	0.9393	0.9820	0.9916	(86)
MIT	19.1951	19.4298	19.7865	20.2358	20.6196	20.8702	20.9600	20.9447	20.7610	20.2538	19.6411	19.1551	(87)
Th 2	19.9186	19.9211	19.9236	19.9353	19.9375	19.9477	19.9477	19.9496	19.9438	19.9375	19.9330	19.9284	(88)
util rest of house	0.9872	0.9757	0.9517	0.8945	0.7808	0.5976	0.4171	0.4662	0.7240	0.9200	0.9772	0.9896	(89)
MIT 2	18.2783	18.5125	18.8655	19.3084	19.6626	19.8762	19.9335	19.9283	19.7956	19.3355	18.7329	18.2459	(90)
Living area fraction	18.4823	18.7166	19.0704	19.5147	19.8755	20.0973	20.1618	20.1544	20.0104	19.5398	18.9349	18.4482	(91)
MIT	18.4823	18.7166	19.0704	19.5147	19.8755	20.0973	20.1618	20.1544	20.0104	19.5398	18.9349	18.4482	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4823	18.7166	19.0704	19.5147	19.8755	20.0973	20.1618	20.1544	20.0104	19.5398	18.9349	18.4482	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	417.1304	489.4580	542.5096	566.9376	529.6990	407.2302	281.6900	292.3152	402.3784	440.0981	409.2279	392.8625	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1196.8342	1162.8993	1055.2703	880.2214	676.3808	449.9069	291.5045	306.6405	485.7395	739.6131	983.7254	1190.0941	(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	580.0996	452.5525	381.4940	225.5643	109.1313	0.0000	0.0000	0.0000	0.0000	222.8392	413.6382	593.1403	(98)
Space heating												2978.4593	(98)
Space heating per m2												42.4161	(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	769.3042	605.6225	620.7351	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8248	0.8851	0.8620	0.0000	0.0000	0.0000	0.0000	(101)

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Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	634.4941	536.0507	535.0659	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	863.9509	828.2988	781.3433	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	165.2089	217.4326	183.2304	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												565.8718 (104)
Cooled fraction									FC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	41.3022	54.3581	45.8076	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												141.4680 (107)
Space cooling per m2												2.0146 (108)
Energy for space heating												42.4161 (99)
Energy for space cooling												2.0146 (108)
Total												44.4308 (109)
Dwelling Fabric Energy Efficiency (DFEE)												44.4 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	35.1100 (1b)	x 2.3900 (2b)	= 83.9129 (1b) - (3b)
First floor	35.1100 (1c)	x 2.6700 (2c)	= 93.7437 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.2200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 177.6566 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1689 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4189 (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) =	0.3875 (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	0.4940	0.4843	0.4746	0.4262	0.4165	0.3681	0.3681	0.3584	0.3875	0.4165	0.4359	0.4553 (22b)
Effective ac	0.6220	0.6173	0.6126	0.5908	0.5867	0.5677	0.5677	0.5642	0.5751	0.5867	0.5950	0.6036 (25)

3. Heat losses and heat loss parameter

Element	Gross m2			Openings m2		NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K		
TER Opaque door						2.1200	1.0000	2.1200		(26)		
TER Opening Type (Uw = 1.40)						12.2400	1.3258	16.2273		(27)		
Ground Floor						35.1100	0.1300	4.5643		(28a)		
Brick and Block	84.9600			14.3600		70.6000	0.1800	12.7080		(29a)		
Pitched Roof	35.1100					35.1100	0.1300	4.5643		(30)		
Total net area of external elements Aum(A, m2)						155.1800				(31)		
Fabric heat loss, W/K = Sum (A x U)							(26)...(30) + (32) =	40.1839		(33)		
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K											250.0000 (35)	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)											9.1539 (36)	
Total fabric heat loss										(33) + (36) =	49.3378 (37)	
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	36.4668	36.1890	35.9168	34.6379	34.3986	33.2847	33.2847	33.0785	33.7138	34.3986	34.8827	35.3887 (38)
	85.8046	85.5268	85.2545	83.9757	83.7364	82.6225	82.6225	82.4162	83.0516	83.7364	84.2204	84.7265 (39)
Average = Sum(39)m / 12 =												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2219	1.2180	1.2141	1.1959	1.1925	1.1766	1.1766	1.1737	1.1827	1.1925	1.1994	1.2066 (40)
HLP (average)												
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												2.2515 (42)
Average daily hot water use (litres/day)												87.6720 (43)
Daily hot water use	Jan 96.4392	Feb 92.9324	Mar 89.4255	Apr 85.9186	May 82.4117	Jun 78.9048	Jul 78.9048	Aug 82.4117	Sep 85.9186	Oct 89.4255	Nov 92.9324	Dec 96.4392 (44)
Energy conte	143.0166	125.0832	129.0747	112.5304	107.9756	93.1748	86.3401	99.0766	100.2598	116.8432	127.5435	138.5039 (45)
Energy content (annual)										Total = Sum(45)m =		1379.4225 (45)
Distribution loss (46)m = 0.15 x (45)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

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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	0.0000 (57)
Heat gains from water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
	30.3910	26.5802	27.4284	23.9127	22.9448	19.7996	18.3473	21.0538	21.3052	24.8292	27.1030	29.4321	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	112.5727	112.5727	112.5727	112.5727	112.5727	112.5727	112.5727	112.5727	112.5727	112.5727	112.5727	112.5727	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	18.1079	16.0832	13.0798	9.9022	7.4020	6.2491	6.7524	8.7770	11.7805	14.9580	17.4582	18.6111	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	197.8100	199.8626	194.6900	183.6782	169.7776	156.7131	147.9852	145.9326	151.1052	162.1171	176.0176	189.0821	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.2573	34.2573	34.2573	34.2573	34.2573	34.2573	34.2573	34.2573	34.2573	34.2573	34.2573	34.2573	(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)													
	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	(71)
Water heating gains (Table 5)													
	40.8482	39.5539	36.8661	33.2121	30.8398	27.4995	24.6603	28.2981	29.5906	33.3725	37.6430	39.5593	(72)
Total internal gains	313.5378	312.2715	301.4077	283.5643	264.7913	247.2335	236.1697	239.7795	249.2480	267.2194	287.8906	304.0243	(73)

6. Solar gains													

[Jan]													
			Area	Solar flux		g	FF		Access			Gains	
			m2	Table 6a		Specific data	Specific data		factor			W	
				W/m2		or Table 6b	or Table 6c		Table 6d				
Northeast			3.4300	11.2829		0.6300	0.7000		0.7700			11.8274	(75)
Southeast			1.3200	36.7938		0.6300	0.7000		0.7700			14.8430	(77)
Southwest			7.4900	36.7938		0.6300	0.7000		0.7700			84.2226	(79)

Solar gains	110.8929	192.8203	274.2601	357.3122	416.1842	420.1968	402.1922	357.1976	302.8529	215.9210	133.5396	94.4383	(83)
Total gains	424.4308	505.0918	575.6678	640.8766	680.9755	667.4304	638.3620	596.9770	552.1010	483.1405	421.4302	398.4626	(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	56.8313	57.0159	57.1980	58.0691	58.2350	59.0201	59.0201	59.1678	58.7152	58.2350	57.9003	57.5545	
alpha	4.7888	4.8011	4.8132	4.8713	4.8823	4.9347	4.9347	4.9445	4.9143	4.8823	4.8600	4.8370	
util living area	0.9979	0.9949	0.9863	0.9581	0.8805	0.7226	0.5537	0.6087	0.8460	0.9741	0.9955	0.9985	(86)
MIT	19.6675	19.8447	20.1164	20.4667	20.7622	20.9381	20.9866	20.9791	20.8591	20.4688	20.0044	19.6424	(87)
Th 2	19.9025	19.9056	19.9087	19.9233	19.9260	19.9387	19.9387	19.9411	19.9338	19.9260	19.9205	19.9147	(88)
util rest of house	0.9972	0.9931	0.9814	0.9420	0.8347	0.6291	0.4282	0.4815	0.7725	0.9611	0.9937	0.9980	(89)
MIT 2	18.6939	18.8728	19.1443	19.4962	19.7662	19.9105	19.9354	19.9353	19.8567	19.5059	19.0443	18.6786	(90)
Living area fraction									fLA = Living area / (4) =			0.2224	(91)
MIT	18.9104	19.0890	19.3606	19.7121	19.9878	20.1391	20.1692	20.1674	20.0797	19.7201	19.2579	18.8929	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9104	19.0890	19.3606	19.7121	19.9878	20.1391	20.1692	20.1674	20.0797	19.7201	19.2579	18.8929	(93)

8. Space heating requirement													

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9963	0.9913	0.9781	0.9381	0.8378	0.6482	0.4564	0.5101	0.7841	0.9579	0.9921	0.9972	(94)
Useful gains	422.8580	500.6798	563.0655	601.2003	570.4927	432.6423	291.3517	304.4944	432.9077	462.7800	418.0957	397.3652	(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	1253.6420	1213.5410	1096.4211	907.9523	693.9892	457.6561	294.8989	310.4987	496.6214	763.6819	1023.9430	1244.8816	(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	618.1032	479.0427	396.8166	220.8614	91.8814	0.0000	0.0000	0.0000	0.0000	223.8710	436.2101	630.5522	(98)
Space heating												3097.3386	(98)
Space heating per m2												44.1091	(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	776.6517	611.4066	626.3635	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8725	0.9299	0.9091	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	677.6413	568.5491	569.4256	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	863.9509	828.2988	781.3433	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	134.1429	193.2538	157.6668	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												485.0635	(104)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Cooled fraction											FC = cooled area / (4) =	1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	33.5357	48.3135	39.4167	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												121.2659 (107)
Space cooling per m2												1.7269 (108)
Energy for space heating												44.1091 (99)
Energy for space cooling												1.7269 (108)
Total												45.8360 (109)
Target Fabric Energy Efficiency (TFEE)												52.7 (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	35.1100 (1b)	x 2.3900 (2b)	= 83.9129 (1b) - (3b)
First floor	35.1100 (1c)	x 2.6700 (2c)	= 93.7437 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.2200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 177.6566 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					4.1200
Infiltration rate					0.2060 (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)	=	0.1906 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000 (22)
Wind factor	1.1750	1.1000	1.1000	1.0000	1.0250	0.9750	0.9750	0.9500	0.9500	1.0250	1.0000	1.0250 (22a)
Adj infilt rate	0.2239	0.2096	0.2096	0.1906	0.1953	0.1858	0.1858	0.1810	0.1810	0.1953	0.1906	0.1953 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			12.2400	1.1450	14.0153		(27)
Ground Floor			35.1100	0.1200	4.2132	84.0000	2949.2400 (28a)
Brick and Block	84.9600	14.3600	70.6000	0.2400	16.9440	42.2200	2980.7320 (29a)
Pitched Roof	35.1100		35.1100	0.1000	3.5110	9.1000	319.5010 (30)
Total net area of external elements Aum(A, m ²)			155.1800				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	41.0155			(33)
Party Wall 1			42.9200	0.0000	0.0000	70.0000	3004.4000 (32)
GF Stud			60.0000			9.0000	540.0000 (32c)
First Floor			75.1900			9.0000	676.7100 (32c)
Internal Floor 1			35.1100			18.0000	631.9800 (32d)
Internal Ceiling 1			35.1100			18.0000	631.9800 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	11734.5430 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							167.1111 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.3312 (36)
Total fabric heat loss						(33) + (36) =	49.3467 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133 (38)
Average = Sum(39)m / 12 =	78.6600	78.6600	78.6600	78.6600	78.6600	78.6600	78.6600	78.6600	78.6600	78.6600	78.6600	78.6600 (39)
	78.6600	78.6600	78.6600	78.6600	78.6600	78.6600	78.6600	78.6600	78.6600	78.6600	78.6600	78.6600 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1202	1.1202	1.1202	1.1202	1.1202	1.1202	1.1202	1.1202	1.1202	1.1202	1.1202	1.1202 (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												2.2515 (42)
Average daily hot water use (litres/day)												87.6720 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Energy conte	96.4392	92.9324	89.4255	85.9186	82.4117	78.9048	78.9048	82.4117	85.9186	89.4255	92.9324	96.4392 (44)
Energy content (annual)	143.0166	125.0832	129.0747	112.5304	107.9756	93.1748	86.3401	99.0766	100.2598	116.8432	127.5435	138.5039 (45)
Distribution loss (46)m = 0.15 x (45)m	21.4525	18.7625	19.3612	16.8796	16.1963	13.9762	12.9510	14.8615	15.0390	17.5265	19.1315	1379.4225 (45)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	31.2121	28.1758	31.1694	30.1354	31.1192	30.0914	31.0795	31.1052	30.1154	31.1486	30.1769	31.2039 (61)
Total heat required for water heating calculated for each month	174.2288	153.2590	160.2441	142.6658	139.0948	123.2662	117.4197	130.1818	130.3752	147.9918	157.7204	169.7078 (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	174.2288	153.2590	160.2441	142.6658	139.0948	123.2662	117.4197	130.1818	130.3752	147.9918	157.7204	169.7078 (64)
RHI water heating demand												
Heat gains from water heating, kWh/month	55.3561	48.6341	50.7097	44.9502	43.6817	38.5035	36.4780	40.7193	40.8652	46.6375	49.9524	53.8535 (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	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	45.2696	40.2081	32.6994	24.7556	18.5051	15.6228	16.8809	21.9425	29.4512	37.3950	43.6455	46.5278 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	295.2388	298.3024	290.5821	274.1465	253.3995	233.9002	220.8735	217.8098	225.5301	241.9658	262.7128	282.2121 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602 (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)	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582 (71)
Water heating gains (Table 5)	74.4033	72.3722	68.1582	62.4309	58.7120	53.4770	49.0295	54.7302	56.7573	62.6848	69.3784	72.3838 (72)
Total internal gains	513.7010	509.6720	490.2290	460.1222	429.4058	401.7892	385.5732	393.2718	410.5278	440.8349	474.5259	499.9129 (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			
Northeast				3.4300	14.6130	0.6300	0.7000	0.7700	15.3182 (75)			
Southeast				1.3200	45.0642	0.6300	0.7000	0.7700	18.1793 (77)			
Southwest				7.4900	45.0642	0.6300	0.7000	0.7700	103.1538 (79)			
Solar gains	136.6512	202.5767	294.5946	387.7825	427.1216	478.0792	439.3048	405.5472	341.3738	245.1024	164.0832	110.1322 (83)
Total gains	650.3522	712.2487	784.8236	847.9047	856.5274	879.8684	824.8780	798.8190	751.9016	685.9373	638.6092	610.0451 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	41.4390	41.4390	41.4390	41.4390	41.4390	41.4390	41.4390	41.4390	41.4390	41.4390	41.4390	41.4390
alpha	3.7626	3.7626	3.7626	3.7626	3.7626	3.7626	3.7626	3.7626	3.7626	3.7626	3.7626	3.7626
util living area	0.9530	0.9348	0.8884	0.7944	0.6495	0.4427	0.3119	0.3123	0.5506	0.7980	0.9191	0.9602 (86)
MIT	19.9198	20.0613	20.3485	20.6644	20.8811	20.9787	20.9958	20.9959	20.9517	20.7212	20.2907	19.8720 (87)
Th 2	19.9844	19.9844	19.9844	19.9844	19.9844	19.9844	19.9844	19.9844	19.9844	19.9844	19.9844	19.9844 (88)
util rest of house	0.9430	0.9214	0.8659	0.7545	0.5856	0.3599	0.2173	0.2146	0.4634	0.7485	0.8995	0.9514 (89)
MIT 2	19.0382	19.1741	19.4465	19.7328	19.9114	19.9759	19.9835	19.9836	19.9621	19.7895	19.3982	18.9925 (90)
Living area fraction									fLA = Living area / (4) =			0.2224 (91)
MIT	19.2343	19.3714	19.6471	19.9401	20.1271	20.1990	20.2087	20.2088	20.1822	19.9967	19.5967	19.1882 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2343	19.3714	19.6471	19.9401	20.1271	20.1990	20.2087	20.2088	20.1822	19.9967	19.5967	19.1882 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	607.4087	649.3918	672.8622	638.1374	509.6735	332.3968	196.6441	188.8312	361.7580	513.8930	568.7890	575.2320 (94)
Ext temp.	5.6000	6.0000	7.6000	10.1000	13.1000	15.9000	17.7000	17.8000	15.4000	12.1000	8.6000	5.7000 (96)
Heat loss rate W	1072.4715	1051.7975	947.6278	774.0188	552.7499	338.1573	197.3354	189.4756	376.1708	621.1556	864.9999	1060.9794 (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	346.0067	270.4166	204.4256	97.8346	32.0489	0.0000	0.0000	0.0000	0.0000	79.8033	213.2718	361.3960 (98)
Space heating												1605.2036 (98)
RHI space heating demand												1605 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	35.1100 (1b)	x 2.3900 (2b)	= 83.9129 (1b) - (3b)
First floor	35.1100 (1c)	x 2.6700 (2c)	= 93.7437 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.2200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 177.6566 (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) =											Air changes per hour		
Pressure test											0.0000 / (5) =		0.0000 (8)
Measured/design AP50											Yes		
Infiltration rate											4.1200		
Number of sides sheltered											0.2060 (18)		
											1 (19)		
Shelter factor											(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =		0.1906 (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													
	0.2430	0.2382	0.2334	0.2096	0.2048	0.1810	0.1810	0.1763	0.1906	0.2048	0.2144	0.2239 (22b)	
Mechanical extract ventilation - centralised													
If mechanical ventilation:												0.5000 (23a)	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)	

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			12.2400	1.1450	14.0153		(27)
Ground Floor			35.1100	0.1200	4.2132	84.0000	2949.2400 (28a)
Brick and Block	84.9600	14.3600	70.6000	0.2400	16.9440	42.2200	2980.7320 (29a)
Pitched Roof	35.1100		35.1100	0.1000	3.5110	9.1000	319.5010 (30)
Total net area of external elements Aum(A, m ²)			155.1800				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	41.0155			(33)
Party Wall 1			42.9200	0.0000	0.0000	70.0000	3004.4000 (32)
GF Stud			60.0000			9.0000	540.0000 (32c)
First Floor			75.1900			9.0000	676.7100 (32c)
Internal Floor 1			35.1100			18.0000	631.9800 (32d)
Internal Ceiling 1			35.1100			18.0000	631.9800 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	11734.5430 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							167.1111 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.3312 (36)
Total fabric heat loss						(33) + (36) =	49.3467 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133 (38)
Heat transfer coeff	78.6600	78.6600	78.6600	78.6600	78.6600	78.6600	78.6600	78.6600	78.6600	78.6600	78.6600	78.6600 (39)
Average = Sum(39)m / 12 =												78.6600 (39)
HLP	1.1202	1.1202	1.1202	1.1202	1.1202	1.1202	1.1202	1.1202	1.1202	1.1202	1.1202	1.1202 (40)
HLP (average)												1.1202 (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	2.2515 (42)
Average daily hot water use (litres/day)	87.6720 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Energy conte	96.4392	92.9324	89.4255	85.9186	82.4117	78.9048	78.9048	82.4117	85.9186	89.4255	92.9324	96.4392 (44)
Energy content (annual)	143.0166	125.0832	129.0747	112.5304	107.9756	93.1748	86.3401	99.0766	100.2598	116.8432	127.5435	138.5039 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum (45)m =		1379.4225 (45)
	21.4525	18.7625	19.3612	16.8796	16.1963	13.9762	12.9510	14.8615	15.0390	17.5265	19.1315	20.7756 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	31.2121	28.1758	31.1694	30.1354	31.1192	30.0914	31.0795	31.1052	30.1154	31.1486	30.1769	31.2039 (61)
Total heat required for water heating calculated for each month	174.2288	153.2590	160.2441	142.6658	139.0948	123.2662	117.4197	130.1818	130.3752	147.9918	157.7204	169.7078 (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	174.2288	153.2590	160.2441	142.6658	139.0948	123.2662	117.4197	130.1818	130.3752	147.9918	157.7204	169.7078 (64)
Heat gains from water heating, kWh/month	55.3561	48.6341	50.7097	44.9502	43.6817	38.5035	36.4780	40.7193	40.8652	46.6375	49.9524	53.8535 (65)
										Solar input (sum of months) = Sum(63)m =		0.0000 (63)
										Total per year (kWh/year) = Sum(64)m =		1746.1553 (64)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	45.2696	40.2081	32.6994	24.7556	18.5051	15.6228	16.8809	21.9425	29.4512	37.3950	43.6455	46.5278 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	295.2388	298.3024	290.5821	274.1465	253.3995	233.9002	220.8735	217.8098	225.5301	241.9658	262.7128	282.2121 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602 (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)	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582 (71)
Water heating gains (Table 5)	74.4033	72.3722	68.1582	62.4309	58.7120	53.4770	49.0295	54.7302	56.7573	62.6848	69.3784	72.3838 (72)
Total internal gains	513.7010	509.6720	490.2290	460.1222	429.4058	401.7892	385.5732	393.2718	410.5278	440.8349	474.5259	499.9129 (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			
Northeast				3.4300	11.2829	0.6300	0.7000	0.7700	11.8274 (75)			
Southeast				1.3200	36.7938	0.6300	0.7000	0.7700	14.8430 (77)			
Southwest				7.4900	36.7938	0.6300	0.7000	0.7700	84.2226 (79)			
Solar gains	110.8929	192.8203	274.2601	357.3122	416.1842	420.1968	357.1976	302.8529	215.9210	133.5396	94.4383 (83)	
Total gains	624.5939	702.4923	764.4891	817.4344	845.5899	821.9861	787.7654	750.4693	713.3808	656.7559	608.0656	594.3513 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	41.4390	41.4390	41.4390	41.4390	41.4390	41.4390	41.4390	41.4390	41.4390	41.4390	41.4390	41.4390
util living area	3.7626	3.7626	3.7626	3.7626	3.7626	3.7626	3.7626	3.7626	3.7626	3.7626	3.7626	3.7626
	0.9671	0.9484	0.9140	0.8456	0.7294	0.5709	0.4280	0.4656	0.6714	0.8670	0.9480	0.9722 (86)
MIT	19.7043	19.9041	20.1933	20.5241	20.7904	20.9377	20.9836	20.9773	20.8836	20.5459	20.0561	19.6421 (87)
Th 2	19.9844	19.9844	19.9844	19.9844	19.9844	19.9844	19.9844	19.9844	19.9844	19.9844	19.9844	19.9844 (88)
util rest of house	0.9603	0.9381	0.8969	0.8147	0.6773	0.4937	0.3341	0.3697	0.5975	0.8335	0.9359	0.9664 (89)
MIT 2	18.8269	19.0212	19.2996	19.6084	19.8403	19.9521	19.9789	19.9762	19.9176	19.6361	19.1729	18.7660 (90)
Living area fraction	19.0220	19.2176	19.4984	19.8121	20.0517	20.1713	20.2024	20.1989	fLA = Living area / (4) =	20.1325	19.8385	19.3693 (91)
MIT	19.0220	19.2176	19.4984	19.8121	20.0517	20.1713	20.2024	20.1989	20.1325	19.8385	19.3693	18.9609 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0220	19.2176	19.4984	19.8121	20.0517	20.1713	20.2024	20.1989	20.1325	19.8385	19.3693	18.9609 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9523	0.9288	0.8873	0.8089	0.6811	0.5086	0.3548	0.3906	0.6091	0.8280	0.9268	0.9590 (94)
Ext temp.	594.8295	652.4521	678.3222	661.2014	575.8957	418.0367	279.4633	293.1259	434.5121	543.8110	563.5802	569.9967 (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	1158.0358	1126.2202	1022.4521	858.3449	656.9426	438.2393	283.3653	298.8220	474.5131	726.6979	965.1066	1161.0932 (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	419.0255	318.3722	256.0326	141.9433	60.2988	0.0000	0.0000	0.0000	0.0000	136.0678	289.0991	439.7758 (98)
Space heating per m2												2060.6152 (98)
												(98) / (4) = 29.3451 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2271.9021 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	419.0255	318.3722	256.0326	141.9433	60.2988	0.0000	0.0000	0.0000	0.0000	136.0678	289.0991	439.7758	(98)
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)
Space heating fuel (main heating system)	461.9906	351.0167	282.2852	156.4976	66.4816	0.0000	0.0000	0.0000	0.0000	150.0197	318.7421	484.8686	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	174.2288	153.2590	160.2441	142.6658	139.0948	123.2662	117.4197	130.1818	130.3752	147.9918	157.7204	169.7078	(64)
Efficiency of water heater	89.5811	89.4636	89.2390	88.8068	88.0867	87.0000	87.0000	87.0000	87.0000	88.7339	89.3586	89.6385	(216)
(217)m	89.5811	89.4636	89.2390	88.8068	88.0867	87.0000	87.0000	87.0000	87.0000	88.7339	89.3586	89.6385	(217)
Fuel for water heating, kWh/month	194.4927	171.3088	179.5672	160.6475	157.9067	141.6852	134.9651	149.6342	149.8566	166.7815	176.5028	189.3247	(219)
Water heating fuel used												1972.6731	(219)
Annual totals kWh/year													
Space heating fuel - main system												2271.9021	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.4200)													
mechanical ventilation fans (SFP = 0.4200)												91.0312	(230a)
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												166.0312	(231)
Electricity for lighting (calculated in Appendix L)												319.7904	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.64 * 1029 * 1.00) =										-526.9436		-526.9436	(233)
Total delivered energy for all uses												4203.4532	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2271.9021	3.4800	79.0622 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1972.6731	3.4800	68.6490 (247)
Mechanical ventilation fans	91.0312	13.1900	12.0070 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	319.7904	13.1900	42.1804 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-526.9436	13.1900	-69.5039 (252)
Total energy cost			262.2872 (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] =	0.9561 (257)
SAP value		86.6626
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	2271.9021	0.2160	490.7308 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1972.6731	0.2160	426.0974 (264)
Space and water heating			916.8282 (265)
Pumps and fans	166.0312	0.5190	86.1702 (267)
Energy for lighting	319.7904	0.5190	165.9712 (268)
Energy saving/generation technologies			
PV Unit	-526.9436	0.5190	-273.4837 (269)
Total kg/year			895.4860 (272)
CO2 emissions per m2			12.7500 (273)
EI value			89.5856
EI rating			90 (274)
EI band			B

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CALCULATION OF ENERGY RATINGS 09 Jan 2014

Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9070 = 3.837$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9070 = 0.2381$, stars = 4
Water heating energy efficiency	$3.48 / 0.8841 = 3.936$, stars = 4
Water heating environmental impact	$0.216 / 0.8841 = 0.2443$, 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	35.1100 (1b)	x 2.3900 (2b)	= 83.9129 (1b) - (3b)
First floor	35.1100 (1c)	x 2.6700 (2c)	= 93.7437 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.2200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 177.6566 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					4.1200
Infiltration rate					0.2060 (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)	=	0.1906 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000 (22)
Wind factor	1.1750	1.1000	1.1000	1.0000	1.0250	0.9750	0.9750	0.9500	0.9500	1.0250	1.0000	1.0250 (22a)
Adj infilt rate	0.2239	0.2096	0.2096	0.1906	0.1953	0.1858	0.1858	0.1810	0.1810	0.1953	0.1906	0.1953 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			12.2400	1.1450	14.0153		(27)
Ground Floor			35.1100	0.1200	4.2132	84.0000	2949.2400 (28a)
Brick and Block	84.9600	14.3600	70.6000	0.2400	16.9440	42.2200	2980.7320 (29a)
Pitched Roof	35.1100		35.1100	0.1000	3.5110	9.1000	319.5010 (30)
Total net area of external elements Aum(A, m ²)			155.1800				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	41.0155			(33)
Party Wall 1			42.9200	0.0000	0.0000	70.0000	3004.4000 (32)
GF Stud			60.0000			9.0000	540.0000 (32c)
First Floor			75.1900			9.0000	676.7100 (32c)
Internal Floor 1			35.1100			18.0000	631.9800 (32d)
Internal Ceiling 1			35.1100			18.0000	631.9800 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	11734.5430 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							167.1111 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.3312 (36)
Total fabric heat loss						(33) + (36) =	49.3467 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 29.3133	Feb 29.3133	Mar 29.3133	Apr 29.3133	May 29.3133	Jun 29.3133	Jul 29.3133	Aug 29.3133	Sep 29.3133	Oct 29.3133	Nov 29.3133	Dec 29.3133 (38)
Heat transfer coeff	78.6600	78.6600	78.6600	78.6600	78.6600	78.6600	78.6600	78.6600	78.6600	78.6600	78.6600	78.6600 (39)
Average = Sum(39)m / 12 =												78.6600 (39)
HLP	Jan 1.1202	Feb 1.1202	Mar 1.1202	Apr 1.1202	May 1.1202	Jun 1.1202	Jul 1.1202	Aug 1.1202	Sep 1.1202	Oct 1.1202	Nov 1.1202	Dec 1.1202 (40)
HLP (average)												1.1202 (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												2.2515 (42)
Average daily hot water use (litres/day)												87.6720 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Energy conte	96.4392	92.9324	89.4255	85.9186	82.4117	78.9048	78.9048	82.4117	85.9186	89.4255	92.9324	96.4392 (44)
Energy content (annual)	143.0166	125.0832	129.0747	112.5304	107.9756	93.1748	86.3401	99.0766	100.2598	116.8432	127.5435	138.5039 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum (45)m =		1379.4225 (45)
	21.4525	18.7625	19.3612	16.8796	16.1963	13.9762	12.9510	14.8615	15.0390	17.5265	19.1315	20.7756 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	31.2121	28.1758	31.1694	30.1354	31.1192	30.0914	31.0795	31.1052	30.1154	31.1486	30.1769	31.2039 (61)
Total heat required for water heating calculated for each month	174.2288	153.2590	160.2441	142.6658	139.0948	123.2662	117.4197	130.1818	130.3752	147.9918	157.7204	169.7078 (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	174.2288	153.2590	160.2441	142.6658	139.0948	123.2662	117.4197	130.1818	130.3752	147.9918	157.7204	169.7078 (64)
Heat gains from water heating, kWh/month	55.3561	48.6341	50.7097	44.9502	43.6817	38.5035	36.4780	40.7193	40.8652	46.6375	49.9524	53.8535 (65)
										Solar input (sum of months) = Sum (63)m =		0.0000 (63)
										Total per year (kWh/year) = Sum (64)m =		1746.1553 (64)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	45.2696	40.2081	32.6994	24.7556	18.5051	15.6228	16.8809	21.9425	29.4512	37.3950	43.6455	46.5278 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	295.2388	298.3024	290.5821	274.1465	253.3995	233.9002	220.8735	217.8098	225.5301	241.9658	262.7128	282.2121 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602 (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)	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582 (71)
Water heating gains (Table 5)	74.4033	72.3722	68.1582	62.4309	58.7120	53.4770	49.0295	54.7302	56.7573	62.6848	69.3784	72.3838 (72)
Total internal gains	513.7010	509.6720	490.2290	460.1222	429.4058	401.7892	385.5732	393.2718	410.5278	440.8349	474.5259	499.9129 (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			
Northeast				3.4300	14.6130	0.6300	0.7000	0.7700	15.3182 (75)			
Southeast				1.3200	45.0642	0.6300	0.7000	0.7700	18.1793 (77)			
Southwest				7.4900	45.0642	0.6300	0.7000	0.7700	103.1538 (79)			
Solar gains	136.6512	202.5767	294.5946	387.7825	427.1216	478.0792	439.3048	405.5472	341.3738	245.1024	164.0832	110.1322 (83)
Total gains	650.3522	712.2487	784.8236	847.9047	856.5274	879.8684	824.8780	798.8190	751.9016	685.9373	638.6092	610.0451 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	41.4390	41.4390	41.4390	41.4390	41.4390	41.4390	41.4390	41.4390	41.4390	41.4390	41.4390	41.4390
util living area	3.7626	3.7626	3.7626	3.7626	3.7626	3.7626	3.7626	3.7626	3.7626	3.7626	3.7626	3.7626
	0.9530	0.9348	0.8884	0.7944	0.6495	0.4427	0.3119	0.3123	0.5506	0.7980	0.9191	0.9602 (86)
MIT	19.9198	20.0613	20.3485	20.6644	20.8811	20.9787	20.9958	20.9959	20.9517	20.7212	20.2907	19.8720 (87)
Th 2	19.9844	19.9844	19.9844	19.9844	19.9844	19.9844	19.9844	19.9844	19.9844	19.9844	19.9844	19.9844 (88)
util rest of house	0.9430	0.9214	0.8659	0.7545	0.5856	0.3599	0.2173	0.2146	0.4634	0.7485	0.8995	0.9514 (89)
MIT 2	19.0382	19.1741	19.4465	19.7328	19.9114	19.9759	19.9835	19.9836	19.9621	19.7895	19.3982	18.9925 (90)
Living area fraction	19.2343	19.3714	19.6471	19.9401	20.1271	20.1990	20.2087	20.2088	fLA = Living area / (4) =			0.2224 (91)
MIT	19.2343	19.3714	19.6471	19.9401	20.1271	20.1990	20.2087	20.2088	20.1822	19.9967	19.5967	19.1882 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2343	19.3714	19.6471	19.9401	20.1271	20.1990	20.2087	20.2088	20.1822	19.9967	19.5967	19.1882 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9340	0.9117	0.8573	0.7526	0.5950	0.3778	0.2384	0.2364	0.4811	0.7492	0.8907	0.9429 (94)
Ext temp.	607.4087	649.3918	672.8622	638.1374	509.6735	332.3968	196.6441	188.8312	361.7580	513.8930	568.7890	575.2320 (95)
Heat loss rate W	5.6000	6.0000	7.6000	10.1000	13.1000	15.9000	17.7000	17.8000	15.4000	12.1000	8.6000	5.7000 (96)
Month fracti	1072.4715	1051.7975	947.6278	774.0188	552.7499	338.1573	197.3354	189.4756	376.1708	621.1556	864.9999	1060.9794 (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	346.0067	270.4166	204.4256	97.8346	32.0489	0.0000	0.0000	0.0000	0.0000	79.8033	213.2718	361.3960 (98)
Space heating per m2												1605.2036 (98)
										(98) / (4) =		22.8596 (99)

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

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												90.7000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												1769.7945	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	346.0067	270.4166	204.4256	97.8346	32.0489	0.0000	0.0000	0.0000	0.0000	79.8033	213.2718	361.3960	(98)
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)
Space heating fuel (main heating system)	381.4848	298.1440	225.3866	107.8662	35.3350	0.0000	0.0000	0.0000	0.0000	87.9860	235.1398	398.4521	(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													
Efficiency of water heater (217)m	174.2288	153.2590	160.2441	142.6658	139.0948	123.2662	117.4197	130.1818	130.3752	147.9918	157.7204	169.7078	(64)
Fuel for water heating, kWh/month	89.4263	89.3258	89.0361	88.4681	87.6697	87.0000	87.0000	87.0000	87.0000	88.2614	89.0892	89.4840	(216)
Water heating fuel used	194.8294	171.5731	179.9766	161.2625	158.6577	141.6852	134.9651	149.6342	149.8566	167.6745	177.0364	189.6517	(219)
Annual totals kWh/year												1976.8030	(219)
Space heating fuel - main system												1769.7945	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.4200)													
mechanical ventilation fans (SFP = 0.4200)												91.0312	(230a)
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												166.0312	(231)
Electricity for lighting (calculated in Appendix L)												319.7904	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.64 * 1154 * 1.00) =										-591.0819		-591.0819	(233)
Total delivered energy for all uses												3641.3373	(238)

10a. Fuel costs - using BEDF prices (491)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1769.7945	3.6300	64.2435 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1976.8030	3.6300	71.7579 (247)
Mechanical ventilation fans	91.0312	19.4400	17.6965 (249)
Pumps and fans for heating	75.0000	19.4400	14.5800 (249)
Energy for lighting	319.7904	19.4400	62.1673 (250)
Additional standing charges			95.0000 (251)
Energy saving/generation technologies			
PV Unit	-591.0819	19.4400	-114.9063 (252)
Total energy cost			210.5389 (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	1769.7945	0.2160	382.2756 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1976.8030	0.2160	426.9894 (264)
Space and water heating			809.2651 (265)
Pumps and fans	166.0312	0.5190	86.1702 (267)
Energy for lighting	319.7904	0.5190	165.9712 (268)
Energy saving/generation technologies			
PV Unit	-591.0819	0.5190	-306.7715 (269)
Total kg/year			754.6350 (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	1769.7945	1.2200	2159.1493 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1976.8030	1.2200	2411.6997 (264)
Space and water heating			4570.8490 (265)
Pumps and fans	166.0312	3.0700	509.7159 (267)
Energy for lighting	319.7904	3.0700	981.7567 (268)

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Energy saving/generation technologies			
PV Unit	-591.0819	3.0700	-1814.6214 (269)
Primary energy kWh/year			4247.7002 (272)
Primary energy kWh/m2/year			60.4913 (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	Recommended
O	Not considered
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U Solar photovoltaic panels	Already installed
A2	Not considered
A3	Not considered
T2	Not considered
W	Not considered
X	Not considered
Y	Not considered
J2	Not considered
Q2	Not considered
Z1	Not considered
Z2	Not considered
Z3	Not considered
Z4	Not considered
Z5	Not considered
V2 Wind turbine	Not applicable
L2	Not considered
Q3	Not considered
O3	Not considered

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.3	-£ 26	-184 kg (24.4%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£26 2.63 kg/m²	B 88	A 92
Total Savings	£26 2.63 kg/m²		

Potential energy efficiency rating:	B 88
Potential environmental impact rating:	A 92

Fuel prices for cost data on this page from database revision number 491 TEST (28 Feb 2022)
Recommendation texts revision number 4.9c (22 Feb 2014)

Typical heating and lighting costs of this home (per year, Southern England):

	Current	Potential	Saving
Electricity	£94	£104	-£10
Mains gas	£231	£196	£35
Space heating	£192	£192	£0
Water heating	£72	£46	£26
Lighting	£62	£62	£0
Generated (PV)	-£115	-£115	£0
Total cost of fuels	£210	£185	£25
Total cost of uses	£211	£185	£26
Delivered energy	52 kWh/m²	39 kWh/m²	13 kWh/m²
Carbon dioxide emissions	0.8 tonnes	0.6 tonnes	0.2 tonnes
CO2 emissions per m²	11 kg/m²	8 kg/m²	3 kg/m²
Primary energy	60 kWh/m²	46 kWh/m²	15 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	35.1100 (1b)	x 2.3900 (2b)	= 83.9129 (1b) - (3b)
First floor	35.1100 (1c)	x 2.6700 (2c)	= 93.7437 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.2200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 177.6566 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					4.1200
Infiltration rate					0.2060 (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) =		0.1906 (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	0.2430	0.2382	0.2334	0.2096	0.2048	0.1810	0.1810	0.1763	0.1906	0.2048	0.2144	0.2239 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			12.2400	1.1450	14.0153		(27)
Ground Floor			35.1100	0.1200	4.2132	84.0000	2949.2400 (28a)
Brick and Block	84.9600	14.3600	70.6000	0.2400	16.9440	42.2200	2980.7320 (29a)
Pitched Roof	35.1100		35.1100	0.1000	3.5110	9.1000	319.5010 (30)
Total net area of external elements Aum(A, m ²)			155.1800				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	41.0155			(33)
Party Wall 1			42.9200	0.0000	0.0000	70.0000	3004.4000 (32)
GF Stud			60.0000			9.0000	540.0000 (32c)
First Floor			75.1900			9.0000	676.7100 (32c)
Internal Floor 1			35.1100			18.0000	631.9800 (32d)
Internal Ceiling 1			35.1100			18.0000	631.9800 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	11734.5430 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							167.1111 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.3312 (36)
Total fabric heat loss						(33) + (36) =	49.3467 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133 (38)
Average = Sum(39)m / 12 =	78.6600	78.6600	78.6600	78.6600	78.6600	78.6600	78.6600	78.6600	78.6600	78.6600	78.6600	78.6600 (39)
	78.6600	78.6600	78.6600	78.6600	78.6600	78.6600	78.6600	78.6600	78.6600	78.6600	78.6600	78.6600 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1202	1.1202	1.1202	1.1202	1.1202	1.1202	1.1202	1.1202	1.1202	1.1202	1.1202	1.1202 (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												2.2515 (42)
Average daily hot water use (litres/day)												87.6720 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												

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CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Energy conte	96.4392	92.9324	89.4255	85.9186	82.4117	78.9048	78.9048	82.4117	85.9186	89.4255	92.9324	96.4392 (44)
Energy content (annual)	143.0166	125.0832	129.0747	112.5304	107.9756	93.1748	86.3401	99.0766	100.2598	116.8432	127.5435	138.5039 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum (45)m =		1379.4225 (45)
	21.4525	18.7625	19.3612	16.8796	16.1963	13.9762	12.9510	14.8615	15.0390	17.5265	19.1315	20.7756 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	31.2121	28.1758	31.1694	30.1354	31.1192	30.0914	31.0795	31.1052	30.1154	31.1486	30.1769	31.2039 (61)
Total heat required for water heating calculated for each month	174.2288	153.2590	160.2441	142.6658	139.0948	123.2662	117.4197	130.1818	130.3752	147.9918	157.7204	169.7078 (62)
Aperture area of solar collector												3.0000 (H1)
Zero-loss collector efficiency												0.7000 (H2)
Collector heat loss coefficient												1.8000 (H3)
Collector 2nd order heat loss coefficient												0.0050 (H3a)
Collector effective heat loss coefficient												1.8063 (H3b)
Collector performance ratio												2.5804 (H4)
Annual solar radiation per m2												1079.5246 (H5)
Overshading factor												0.8000 (H6)
Solar energy available												1813.6014 (H7)
Adjustment factor for showers												1.0000 (H7a)
Solar-to-load ratio												1.3148 (H8)
Utilisation factor												0.5326 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												87.6720 (H14)
Volume ratio Veff/V												0.8555 (H15)
Solar storage volume factor												0.9688 (H16)
Solar input												-822.8328 (H17)
Solar input	-23.8605	-39.8163	-67.8118	-90.8811	-112.2760	-110.3852	-108.9264	-95.1695	-74.5368	-50.8999	-28.3020	-19.9672 (63)
								Solar input (sum of months) =	Sum (63)m =			-822.8328 (63)
Output from w/h	150.3682	113.4427	92.4323	51.7847	26.8188	12.8810	8.4933	35.0122	55.8384	97.0919	129.4184	149.7406 (64)
								Total per year (kWh/year) =	Sum (64)m =			923.3225 (64)
Heat gains from water heating, kWh/month	55.3561	48.6341	50.7097	44.9502	43.6817	38.5035	36.4780	40.7193	40.8652	46.6375	49.9524	53.8535 (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	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	45.2696	40.2081	32.6994	24.7556	18.5051	15.6228	16.8809	21.9425	29.4512	37.3950	43.6455	46.5278	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	295.2388	298.3024	290.5821	274.1465	253.3995	233.9002	220.8735	217.8098	225.5301	241.9658	262.7128	282.2121	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	(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)	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	(71)
Water heating gains (Table 5)	74.4033	72.3722	68.1582	62.4309	58.7120	53.4770	49.0295	54.7302	56.7573	62.6848	69.3784	72.3838	(72)
Total internal gains	513.7010	509.6720	490.2290	460.1222	429.4058	401.7892	385.5732	393.2718	410.5278	440.8349	474.5259	499.9129	(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
Northeast				3.4300	11.2829		0.6300		0.7000		0.7700		11.8274 (75)
Southeast				1.3200	36.7938		0.6300		0.7000		0.7700		14.8430 (77)
Southwest				7.4900	36.7938		0.6300		0.7000		0.7700		84.2226 (79)
Solar gains	110.8929	192.8203	274.2601	357.3122	416.1842	420.1968	402.1922	357.1976	302.8529	215.9210	133.5396		94.4383 (83)
Total gains	624.5939	702.4923	764.4891	817.4344	845.5899	821.9861	787.7654	750.4693	713.3808	656.7559	608.0656		594.3513 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	41.4390	41.4390	41.4390	41.4390	41.4390	41.4390	41.4390	41.4390	41.4390	41.4390	41.4390	41.4390	
alpha	3.7626	3.7626	3.7626	3.7626	3.7626	3.7626	3.7626	3.7626	3.7626	3.7626	3.7626	3.7626	
util living area	0.9671	0.9484	0.9140	0.8456	0.7294	0.5709	0.4280	0.4656	0.6714	0.8670	0.9480	0.9722	(86)
MIT	19.7043	19.9041	20.1933	20.5241	20.7904	20.9377	20.9836	20.9773	20.8836	20.5459	20.0561	19.6421	(87)
Th 2	19.9844	19.9844	19.9844	19.9844	19.9844	19.9844	19.9844	19.9844	19.9844	19.9844	19.9844	19.9844	(88)
util rest of house	0.9603	0.9381	0.8969	0.8147	0.6773	0.4937	0.3341	0.3697	0.5975	0.8335	0.9359	0.9664	(89)
MIT 2	18.8269	19.0212	19.2996	19.6084	19.8403	19.9521	19.9789	19.9762	19.9176	19.6361	19.1729	18.7660	(90)
Living area fraction									fLA = Living area / (4) =			0.2224	(91)
MIT	19.0220	19.2176	19.4984	19.8121	20.0517	20.1713	20.2024	20.1989	20.1325	19.8385	19.3693	18.9609	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0220	19.2176	19.4984	19.8121	20.0517	20.1713	20.2024	20.1989	20.1325	19.8385	19.3693	18.9609	(93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2271.9021	0.2160	490.7308 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1034.2593	0.2160	223.4000 (264)
Space and water heating			714.1309 (265)
Pumps and fans	216.0312	0.5190	112.1202 (267)
Energy for lighting	319.7904	0.5190	165.9712 (268)
Energy saving/generation technologies			
PV Unit	-526.9436	0.5190	-273.4837 (269)
Total kg/year			718.7386 (272)
CO2 emissions per m2			10.2400 (273)
EI value			91.6411
EI rating			92 (274)
EI band			A

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

SAP 2012 WORKSHEET FOR New Build (As Built) (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	35.1100 (1b)	x 2.3900 (2b)	= 83.9129 (1b) - (3b)
First floor	35.1100 (1c)	x 2.6700 (2c)	= 93.7437 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.2200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	177.6566 (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											4.1200	
Infiltration rate											0.2060 (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) =	0.1906 (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	0.2239	0.2096	0.2096	0.1906	0.1953	0.1858	0.1858	0.1810	0.1810	0.1953	0.1906	0.1953 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			12.2400	1.1450	14.0153		(27)
Ground Floor			35.1100	0.1200	4.2132	84.0000	2949.2400 (28a)
Brick and Block	84.9600	14.3600	70.6000	0.2400	16.9440	42.2200	2980.7320 (29a)
Pitched Roof	35.1100		35.1100	0.1000	3.5110	9.1000	319.5010 (30)
Total net area of external elements Aum(A, m ²)			155.1800				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	41.0155			(33)
Party Wall 1			42.9200	0.0000	0.0000	70.0000	3004.4000 (32)
GF Stud			60.0000			9.0000	540.0000 (32c)
First Floor			75.1900			9.0000	676.7100 (32c)
Internal Floor 1			35.1100			18.0000	631.9800 (32d)
Internal Ceiling 1			35.1100			18.0000	631.9800 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	11734.5430 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							167.1111 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.3312 (36)
Total fabric heat loss						(33) + (36) =	49.3467 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133	29.3133 (38)
Heat transfer coeff	78.6600	78.6600	78.6600	78.6600	78.6600	78.6600	78.6600	78.6600	78.6600	78.6600	78.6600	78.6600 (39)
Average = Sum(39)m / 12 =												78.6600 (39)
HLP	1.1202	1.1202	1.1202	1.1202	1.1202	1.1202	1.1202	1.1202	1.1202	1.1202	1.1202	1.1202 (40)
HLP (average)												1.1202 (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	2.2515 (42)
Average daily hot water use (litres/day)	87.6720 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Energy conte	96.4392	92.9324	89.4255	85.9186	82.4117	78.9048	78.9048	82.4117	85.9186	89.4255	92.9324	96.4392 (44)
Energy content (annual)	143.0166	125.0832	129.0747	112.5304	107.9756	93.1748	86.3401	99.0766	100.2598	116.8432	127.5435	138.5039 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum (45)m =		1379.4225 (45)
	21.4525	18.7625	19.3612	16.8796	16.1963	13.9762	12.9510	14.8615	15.0390	17.5265	19.1315	20.7756 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	31.2121	28.1758	31.1694	30.1354	31.1192	30.0914	31.0795	31.1052	30.1154	31.1486	30.1769	31.2039 (61)
Total heat required for water heating calculated for each month	174.2288	153.2590	160.2441	142.6658	139.0948	123.2662	117.4197	130.1818	130.3752	147.9918	157.7204	169.7078 (62)
Aperture area of solar collector												3.0000 (H1)
Zero-loss collector efficiency												0.7000 (H2)
Collector heat loss coefficient												1.8000 (H3)
Collector 2nd order heat loss coefficient												0.0050 (H3a)
Collector effective heat loss coefficient												1.8063 (H3b)
Collector performance ratio												2.5804 (H4)
Annual solar radiation per m2												1206.0102 (H5)
Overshading factor												0.8000 (H6)
Solar energy available												2026.0972 (H7)
Adjustment factor for showers												1.0000 (H7a)
Solar-to-load ratio												1.4688 (H8)
Utilisation factor												0.4938 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												87.6720 (H14)
Volume ratio Veff/V												0.8555 (H15)
Solar storage volume factor												0.9688 (H16)
Solar input	-27.8102	-39.5493	-68.6282	-92.3165	-107.2780	-116.6874	-110.6374	-100.8906	-78.9669	-54.5791	-32.8932	-852.2574 (H17)
Solar input (sum of months) = Sum (63)m =												-852.2574 (63)
Output from w/h	146.4185	113.7097	91.6159	50.3493	31.8168	6.5788	6.7822	29.2912	51.4084	93.4127	124.8272	147.6872 (64)
Total per year (kWh/year) = Sum (64)m =												893.8979 (64)
Heat gains from water heating, kWh/month	55.3561	48.6341	50.7097	44.9502	43.6817	38.5035	36.4780	40.7193	40.8652	46.6375	49.9524	53.8535 (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	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	135.0872	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	45.2696	40.2081	32.6994	24.7556	18.5051	15.6228	16.8809	21.9425	29.4512	37.3950	43.6455	46.5278	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	295.2388	298.3024	290.5821	274.1465	253.3995	233.9002	220.8735	217.8098	225.5301	241.9658	262.7128	282.2121	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	50.7602	(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)	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	-90.0582	(71)
Water heating gains (Table 5)	74.4033	72.3722	68.1582	62.4309	58.7120	53.4770	49.0295	54.7302	56.7573	62.6848	69.3784	72.3838	(72)
Total internal gains	513.7010	509.6720	490.2290	460.1222	429.4058	401.7892	385.5732	393.2718	410.5278	440.8349	474.5259	499.9129	(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
Northeast				3.4300	14.6130		0.6300		0.7000		0.7700		15.3182 (75)
Southeast				1.3200	45.0642		0.6300		0.7000		0.7700		18.1793 (77)
Southwest				7.4900	45.0642		0.6300		0.7000		0.7700		103.1538 (79)
Solar gains	136.6512	202.5767	294.5946	387.7825	427.1216	478.0792	439.3048	405.5472	341.3738	245.1024	164.0832	110.1322	(83)
Total gains	650.3522	712.2487	784.8236	847.9047	856.5274	879.8684	824.8780	798.8190	751.9016	685.9373	638.6092	610.0451	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	41.4390	41.4390	41.4390	41.4390	41.4390	41.4390	41.4390	41.4390	41.4390	41.4390	41.4390	41.4390	
alpha	3.7626	3.7626	3.7626	3.7626	3.7626	3.7626	3.7626	3.7626	3.7626	3.7626	3.7626	3.7626	
util living area	0.9530	0.9348	0.8884	0.7944	0.6495	0.4427	0.3119	0.3123	0.5506	0.7980	0.9191	0.9602	(86)
MIT	19.9198	20.0613	20.3485	20.6644	20.8811	20.9787	20.9958	20.9959	20.9517	20.7212	20.2907	19.8720	(87)
Th 2	19.9844	19.9844	19.9844	19.9844	19.9844	19.9844	19.9844	19.9844	19.9844	19.9844	19.9844	19.9844	(88)
util rest of house	0.9430	0.9214	0.8659	0.7545	0.5856	0.3599	0.2173	0.2146	0.4634	0.7485	0.8995	0.9514	(89)
MIT 2	19.0382	19.1741	19.4465	19.7328	19.9114	19.9759	19.9835	19.9836	19.9621	19.7895	19.3982	18.9925	(90)
Living area fraction									fLA = Living area / (4) =			0.2224	(91)
MIT	19.2343	19.3714	19.6471	19.9401	20.1271	20.1990	20.2087	20.2088	20.1822	19.9967	19.5967	19.1882	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2343	19.3714	19.6471	19.9401	20.1271	20.1990	20.2087	20.2088	20.1822	19.9967	19.5967	19.1882	(93)

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Calculation Type: New Build (As Built)

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

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9340	0.9117	0.8573	0.7526	0.5950	0.3778	0.2384	0.2364	0.4811	0.7492	0.8907	0.9429	(94)
Useful gains	607.4087	649.3918	672.8622	638.1374	509.6735	332.3968	196.6441	188.8312	361.7580	513.8930	568.7890	575.2320	(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													
Month fracti	1072.4715	1051.7975	947.6278	774.0188	552.7499	338.1573	197.3354	189.4756	376.1708	621.1556	864.9999	1060.9794	(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	346.0067	270.4166	204.4256	97.8346	32.0489	0.0000	0.0000	0.0000	0.0000	79.8033	213.2718	361.3960	(98)
Space heating per m2												1605.2036	(98)
											(98) / (4) =	22.8596	(99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													90.7000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													1769.7945	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	346.0067	270.4166	204.4256	97.8346	32.0489	0.0000	0.0000	0.0000	0.0000	79.8033	213.2718	361.3960	(98)	
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)	
Space heating fuel (main heating system)	381.4848	298.1440	225.3866	107.8662	35.3350	0.0000	0.0000	0.0000	0.0000	87.9860	235.1398	398.4521	(211)	
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)	
Water heating														
Water heating requirement	146.4185	113.7097	91.6159	50.3493	31.8168	6.5788	6.7822	29.2912	51.4084	93.4127	124.8272	147.6872	(64)	
Efficiency of water heater	89.5674	89.5723	89.5218	89.4080	88.8182	87.0000	87.0000	87.0000	87.0000	88.6664	89.2979	89.5946	(216)	
Fuel for water heating, kWh/month	163.4730	126.9474	102.3392	56.3141	35.8224	7.5618	7.7957	33.6680	59.0901	105.3530	139.7874	164.8394	(219)	
Water heating fuel used												1002.9915	(219)	
Annual totals kWh/year														
Space heating fuel - main system												1769.7945	(211)	
Space heating fuel - secondary												0.0000	(215)	
Electricity for pumps and fans:														
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.4200)														
mechanical ventilation fans (SFP = 0.4200)													91.0312	(230a)
central heating pump													30.0000	(230c)
main heating flue fan													45.0000	(230e)
pump for solar water heating													50.0000	(230g)
Total electricity for the above, kWh/year													216.0312	(231)
Electricity for lighting (calculated in Appendix L)													319.7904	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 0.64 * 1154 * 1.00) =													-591.0819	(233)
Total delivered energy for all uses													2717.5258	(238)

10a. Fuel costs - using BEDF prices (491)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1769.7945	3.6300	64.2435	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1002.9915	3.6300	36.4086	(247)
Mechanical ventilation fans	91.0312	19.4400	17.6965	(249)
Pumps and fans for heating	75.0000	19.4400	14.5800	(249)
Pump for solar water heating	50.0000	19.4400	9.7200	(249)
Energy for lighting	319.7904	19.4400	62.1673	(250)
Additional standing charges			95.0000	(251)
Energy saving/generation technologies				
PV Unit	-591.0819	19.4400	-114.9063	(252)
Total energy cost			184.9096	(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	1769.7945	0.2160	382.2756	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1002.9915	0.2160	216.6462	(264)
Space and water heating			598.9218	(265)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Pumps and fans	216.0312	0.5190	112.1202 (267)
Energy for lighting	319.7904	0.5190	165.9712 (268)
Energy saving/generation technologies			
PV Unit	-591.0819	0.5190	-306.7715 (269)
Total kg/year			570.2417 (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	1769.7945	1.2200	2159.1493 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1002.9915	1.2200	1223.6496 (264)
Space and water heating			3382.7989 (265)
Pumps and fans	216.0312	3.0700	663.2159 (267)
Energy for lighting	319.7904	3.0700	981.7567 (268)
Energy saving/generation technologies			
PV Unit	-591.0819	3.0700	-1814.6214 (269)
Primary energy kWh/year			3213.1501 (272)
Primary energy kWh/m2/year			45.7583 (273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0647 Plot 83	Issued on Date	29/03/2022
Assessment Reference	As Built	Prop Type Ref	D (HA/AR)
Project	4 Haines Crescent, West End, Southampton, SO30 3LG		
Calculation Type	New Build (As Built)		

SAP Rating	87 B	DER	14.52	TER	19.08
Environmental	90 B	% DER<TER	23.89		
CO ₂ Emissions (t/year)	0.75	DFEE	44.43	TFEE	52.71
General Requirements Compliance	Pass	% DFEE<TFEE	15.71		

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

Building Elements

Roof 000002 - Mineral Wool between and above

Roof Type: Pitched Roof, insulated flat ceiling

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)	Density (kg/m ³)	Heat Cap. (J/kgK)
Ext surface				0.0400			
Layer 1	Earthwool Loft Roll 40						
	Main construction	150	0.0400	3.7500	100.00		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 2	Earthwool Loft Roll 40						
	Main construction	200	0.0400	5.0000	100.00		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 3	Earthwool Loft Roll 40						
	Main construction	100	0.0400	2.5000	87.50		
	Main construction	100	0.1300	0.7692	12.50		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 4	Plasterboard, standard						
	Main construction	12.5	0.2100	0.0595	100.00	700	1000
Int surface				0.1000			

Total resistance:	Upper limit = 11.200 m ² K/W	Lower limit = 10.901 m ² K/W	Average = 11.050 m ² K/W
	Total correction = 0.0065 m ² K/W	U-value (unrounded) = 0.1 W/m ² K	

Unheated space: None

Total thickness: 463 mm

U-value: 0.10 W/m² K

Kappa: 9.10 kJ/m² K

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0647 Plot 83	Issued on Date	29/03/2022
Assessment Reference	As Built	Prop Type Ref	D (HA/AR)
Project	4 Haines Crescent, West End, Southampton, SO30 3LG		
Calculation Type	New Build (As Built)		

SAP Rating	87 B	DER	14.52	TER	19.08
Environmental	90 B	% DER<TER	23.89		
CO ₂ Emissions (t/year)	0.75	DFEE	44.43	TFEE	52.71
General Requirements Compliance	Pass	% DFEE<TFEE	15.71		

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

Wall 000001

Wall Type: Standard Wall

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

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

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

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0647 Plot 83	Issued on Date	29/03/2022
Assessment Reference	As Built	Prop Type Ref	D (HA/AR)
Project	4 Haines Crescent, West End, Southampton, SO30 3LG		
Calculation Type	New Build (As Built)		

SAP Rating	87 B	DER	14.52	TER	19.08
Environmental	90 B	% DER<TER	23.89		
CO ₂ Emissions (t/year)	0.75	DFEE	44.43	TFEE	52.71
General Requirements Compliance	Pass	% DFEE<TFEE	15.71		

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

Floor 000003 - Worst Case Slab

Floor Type: Slab On Ground Floor

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

Horizontal edge insulation: none

Vertical edge insulation: none

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

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

Total correction = 0.0096 m² K/W

U-value (unrounded) = 0.12 W/m² K

Unheated space: None

Total thickness: 321 mm

U-value: 0.12 W/m² K

Kappa: 84.00 kJ/m² K

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Property Reference	SAP 0647 Plot 83	Issued on Date	29/03/2022
Assessment Reference	As Built	Prop Type Ref	D (HA/AR)
Property	4 Haines Crescent, West End, Southampton, SO30 3LG		
SAP Rating	87 B	DER	14.52
Environmental	90 B	TER	19.08
CO ₂ Emissions (t/year)	0.75	% DER<TER	23.89
General Requirements Compliance	Pass	DLEE	44.43
		TFEE	52.71
		% DLEE<TFEE	15.71
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.com		Assessor ID
			E477-0001
Client	Foreman Homes, FORE		

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

Orientation	North East
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Suburban
1.0 Property Type	House, Semi-Detached
2.0 Number of Storeys	2
3.0 Date Built	2020
4.0 Sheltered Sides	1
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements		Heat Loss Perimeter	Internal Floor Area	Average Storey Height
	Ground Floor:	16.79 m	35.11 m ²	2.39 m
	1st Storey:	16.79 m	35.11 m ²	2.67 m

7.0 Living Area	15.62	m ²
8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	167.11	kJ/m ² K

9.0 External Walls			U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Description	Type	Construction				
Brick and Block	Cavity Wall	Other	0.24	42.22	84.96	70.60

9.1 Party Walls			U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)
Description	Type	Construction			
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs on both sides, dense blocks, cavity or cavity fill	0.00	70.00	42.92

9.2 Internal Walls			Kappa (kJ/m ² K)	Area (m ²)
Description	Construction			
GF Stud	Plasterboard on timber frame		9.00	60.00
First Floor	Plasterboard on timber frame		9.00	75.19

10.0 External Roofs			U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Description	Type	Construction				
Pitched Roof	External Plane Roof	Other	0.10	9.10	35.11	35.11

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

10.2 Internal Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Ceiling 1	Plasterboard ceiling, carpeted chipboard floor	9.00	35.11

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	35.11

11.2 Internal Floors

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	Plasterboard ceiling, carpeted chipboard floor	18.00	35.11

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	North East							2.12	
Front Elevation	Window	[1] Brick and Block	North East	None	0.00					3.43	
Side Elevation	Window	[1] Brick and Block	South East	None	0.00					1.32	
Rear Elevation	Window	[1] Brick and Block	South West	None	0.00					7.49	

14.0 Conservatory

None

15.0 Draught Proofing

100

%

16.0 Draught Lobby

No

17.0 Thermal Bridging

Calculate Bridges

17.1 List of Bridges

Source Type	Bridge Type	Length	Psi	Imported	Reference:
Independently assessed	E2 Other lintels (including other steel lintels)	10.13	0.053	No	CD0025
Independently assessed	E3 Sill	7.61	0.034	No	CD0027
Independently assessed	E4 Jamb	27.03	0.039	No	CD0028
Independently assessed	E5 Ground floor (normal)	16.79	0.060	No	CBA-302
Independently assessed	E6 Intermediate floor within a dwelling	16.79	0.000	No	CD0029
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	8.40	0.060	No	
Independently assessed	E12 Gable (insulation at ceiling level)	8.50	0.054	No	CD0031
Independently assessed	E16 Corner (normal)	10.10	0.050	No	CD0035
Table K1 - Approved	E18 Party wall between dwellings	10.10	0.060	No	
Table K1 - Default	P1 Party wall - Ground floor	8.50	0.160	No	
Table K1 - Default	P2 Party wall - Intermediate floor within a dwelling	8.50	0.000	No	
Table K1 - Default	P4 Party wall - Roof (insulation at ceiling level)	8.50	0.240	No	

Y-value	0.054	W/m²K
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18.0 Pressure Testing

Designed AP ₅₀	5.00	m³/(h.m²) @ 50 Pa
Property Tested ?	Yes	
As Built AP ₅₀	4.12	m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Windows open in hot weather	Windows half open
Cross ventilation possible	Yes
Night Ventilation	Yes
Air change rate	4.00

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	No
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - centralised
MV Reference Number	500233
Configuration	2
Manufacturer SFP	0.30
Duct Type	Rigid
Wet Rooms	2

20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				0
Number of passive vents				0
Number of flueless gas fires				0

21.0 Fixed Cooling System

No

22.0 Lighting

Internal

Total number of light fittings	10	
Total number of L.E.L. fittings	10	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted	Yes
Light and motion sensor	Yes

23.0 Electricity Tariff

Standard

24.0 Main Heating 1

	Database	
Description	Gas Combi	
Percentage of Heat	100	%
Database Ref. No.	17503	
Fuel Type	Mains gas	
Main Heating	BGW	
SAP Code	104	
In Winter	90.7	
In Summer	87.0	
Controls	CBE Programmer, room thermostat and TRVs	
PCDF Controls	0	
Delayed Start Stat	No	
Sap Code	2106	
Flue Type	Balanced	
Fan Assisted Flue	Yes	
Is MHS Pumped	Pump in heated space	

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Heat Emitter	Radiators
Flow Temperature	Normal (> 45°C)
Combi boiler type	Standard Combi
Combi keep hot type	Gas/Oil, time clock
25.0 Main Heating 2	None

Community Heating	None
28.0 Water Heating	HWP From main heating 1
Water Heating	Main Heating 1
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
SAP Code	901

29.0 Hot Water Cylinder	None
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32.0 Photovoltaic Unit		One Dwelling		
PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
0.64	South West	30°	None Or Little	Yes

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

	Typical Cost	Typical savings per year	Ratings after improvement	
			SAP rating	Environmental Impact
Solar water heating	£4,000 - £6,000	£26	B 88	