

PREDICTED ENERGY ASSESSMENT

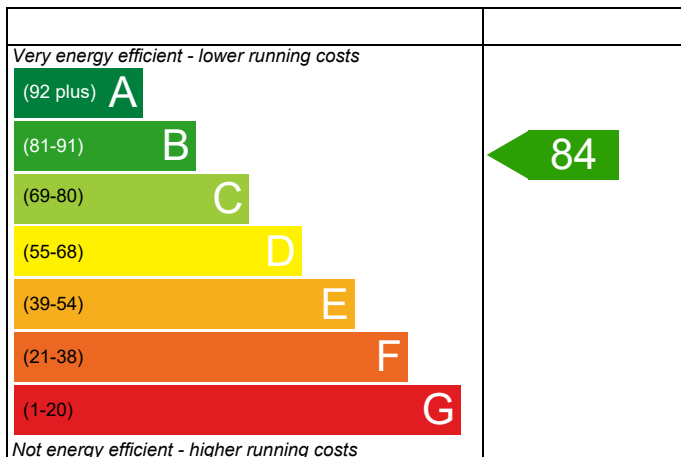
Plot 287

Dwelling type: House, Semi-Detached
Date of assessment: 08/08/2022
Produced by: Scott Binstead
Total floor area: 79 m²

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP2012 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.

Energy Efficiency Rating

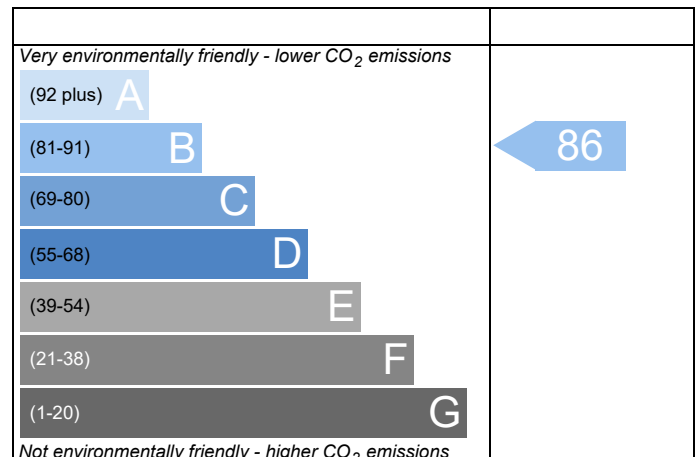


England

EU Directive
2002/91/EC

The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

Environmental Impact (CO₂) Rating



England

EU Directive
2002/91/EC

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO₂) emissions. The higher the rating the less impact it has on the environment.

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	287 - PRJ012557			Issued on Date	08/08/2022
Assessment Reference	287 E	Prop Type Ref	Sansom		
Property	Plot 287				
SAP Rating	84 B	DER	17.70	TER	18.84
Environmental	86 B	% DER<TER	6.03		
CO ₂ Emissions (t/year)	1.21	DFEE	43.62	TFEE	51.33
General Requirements Compliance	Pass	% DFEE<TFEE	15.01		
Assessor Details	Chris Nicholls, , Tel: ,			Assessor ID	U903-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

DWELLING AS DESIGNED

Semi-Detached House, total floor area 79 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) 18.84 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 17.70 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)51.3 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)43.6 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	0.22 (max. 0.25)	0.22 (max. 0.70)	OK
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.26 (max. 2.00)	1.30 (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: 5.01 (design value)
Maximum 10.0 OK

4 Heating efficiency

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

Data from database

Ideal LOGIC COMBI ESPl 30

Combi boiler

Efficiency: 89.6% 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

Not applicable

9 Summertime temperature

Overheating risk (Severn Valley): Not significant OK

Based on:

Overshading:

Average

Windows facing South East: 3.53 m², No overhang

Windows facing North West: 3.36 m², No overhang

Air change rate: 4.21 ach

Blinds/curtains: Dark-coloured curtain or roller blind, closed 100% of daylight hours

10 Key features

Party wall U-value 0.00 W/m²K

Roof U-value 0.10 W/m²K

Thermal bridging y-value 0.025 W/m²K

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
 CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	39.5000 (1b)	2.3300 (2b)	92.0350 (1b) - (3b)
First floor	39.5000 (1c)	2.5300 (2c)	99.9350 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.0000		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 191.9700 (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				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) =	0.1563 (8)							
Pressure test					Yes							
Measured/design AP50					5.0100							
Infiltration rate					0.4068 (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) =		0.3763 (21)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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	0.4797	0.4703	0.4609	0.4139	0.4045	0.3575	0.3575	0.3480	0.3763	0.4045	0.4233	0.4421 (22b)
Effective ac	0.6151	0.6106	0.6062	0.5857	0.5818	0.5639	0.5639	0.5606	0.5708	0.5818	0.5896	0.5977 (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					
Windows (Uw = 1.30)			6.8900	1.2357	8.5143		(27)					
Solid Door			4.2000	1.2000	5.0400		(26)					
Flr - Ground			39.5020	0.2200	8.6904	75.6000	2986.3512 (28a)					
Wl - Brick	86.7660	11.0940	75.6720	0.2400	18.1613	38.9400	2946.6677 (29a)					
RF - Ins Joist	39.5020		39.5020	0.1000	3.9502	5.8200	229.9016 (30)					
Total net area of external elements Aum(A, m2)			165.7660				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.3562		(33)					
Party Wall			39.3810	0.0000	0.0000	54.0300	2127.7554 (32)					
Ground Floor Stud			52.6653			5.8200	306.5120 (32c)					
1st Floor Stud			86.0394			5.8200	500.7495 (32c)					
Internal Floor			39.5000			18.0000	711.0000 (32d)					
Internal Ceiling			39.5000			5.8200	229.8900 (32e)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	10038.8275 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							127.0738 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.1937 (36)					
Total fabric heat loss						(33) + (36) =	48.5499 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 38.9651	Feb 38.6820	Mar 38.4045	Apr 37.1012	May 36.8574	Jun 35.7223	Jul 35.7223	Aug 35.5120	Sep 36.1595	Oct 36.8574	Nov 37.3507	Dec 37.8664 (38)
Heat transfer coeff	87.5150	87.2319	86.9544	85.6511	85.4073	84.2722	84.2722	84.0620	84.7094	85.4073	85.9006	86.4163 (39)
Average = Sum(39)m / 12 =												85.6500 (39)
HLP	Jan 1.1078	Feb 1.1042	Mar 1.1007	Apr 1.0842	May 1.0811	Jun 1.0667	Jul 1.0667	Aug 1.0641	Sep 1.0723	Oct 1.0811	Nov 1.0873	Dec 1.0939 (40)
HLP (average)												1.0842 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.4436 (42)
Average daily hot water use (litres/day)												92.2358 (43)
Daily hot water use	101.4594	97.7700	94.0805	90.3911	86.7017	83.0122	83.0122	86.7017	90.3911	94.0805	97.7700	101.4594 (44)
Energy conte	150.4613	131.5945	135.7937	118.3882	113.5963	98.0250	90.8346	104.2340	105.4789	122.9255	134.1828	145.7138 (45)
Energy content (annual)										Total = Sum(45)m =		1451.2285 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	22.5692	19.7392	20.3691	17.7582	17.0394	14.7037	13.6252	15.6351	15.8218	18.4388	20.1274	21.8571 (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	14.6683	13.2271	14.6002	14.0793	14.5124	14.0024	14.4431	14.4880	14.0443	14.5639	14.1519	14.6541 (61)
Total heat required for water heating calculated for each month	165.1296	144.8215	150.3939	132.4676	128.1087	112.0274	105.2777	118.7220	119.5232	137.4893	148.3346	160.3678 (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	165.1296	144.8215	150.3939	132.4676	128.1087	112.0274	105.2777	118.7220	119.5232	137.4893	148.3346	160.3678 (64)
Heat gains from water heating, kWh/month	53.6955	47.0619	48.8014	42.8839	41.3989	36.0939	33.8133	38.2798	38.5828	44.5137	48.1537	52.1133 (65)
												1622.6634 (64)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	122.1807	122.1807	122.1807	122.1807	122.1807	122.1807	122.1807	122.1807	122.1807	122.1807	122.1807	122.1807 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.8776	20.3197	16.5251	12.5105	9.3518	7.8952	8.5310	11.0889	14.8835	18.8980	22.0568	23.5134 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	217.3379	219.5931	213.9099	201.8109	186.5382	172.1839	162.5944	160.3391	166.0223	178.1213	193.3941	207.7483 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.2181	35.2181	35.2181	35.2181	35.2181	35.2181	35.2181	35.2181	35.2181	35.2181	35.2181	35.2181 (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)	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445 (71)
Water heating gains (Table 5)	72.1713	70.0326	65.5933	59.5610	55.6436	50.1304	45.4479	51.4514	53.5872	59.8302	66.8802	70.0448 (72)
Total internal gains	375.0410	372.5996	358.6825	336.5366	314.1878	292.8637	279.2275	285.5336	297.1473	319.5038	344.9853	363.9608 (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							
Southeast	3.5280	36.7938	0.7600	0.7200	0.7700	49.2247 (77)						
Northwest	3.3620	11.2829	0.7600	0.7200	0.7700	14.3847 (81)						
Solar gains	63.6093	113.1282	167.4782	228.7860	275.6759	282.2230	268.5389	232.2512	188.5036	128.4527	77.0594	53.8733 (83)
Total gains	438.6503	485.7278	526.1607	565.3227	589.8637	575.0867	547.7664	517.7848	485.6509	447.9564	422.0447	417.8341 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	31.8638	31.9672	32.0693	32.5572	32.6502	33.0900	33.0900	33.1727	32.9192	32.6502	32.4627	32.2690
alpha	3.1243	3.1311	3.1380	3.1705	3.1767	3.2060	3.2060	3.2115	3.1946	3.1767	3.1642	3.1513
util living area	0.9836	0.9762	0.9614	0.9277	0.8594	0.7372	0.5993	0.6422	0.8268	0.9402	0.9756	0.9859 (86)
MIT	18.9713	19.1658	19.5099	19.9845	20.4295	20.7699	20.9152	20.8919	20.6358	20.0727	19.4497	18.9433 (87)
Th 2	19.9945	19.9974	20.0003	20.0138	20.0163	20.0281	20.0281	20.0303	20.0235	20.0163	20.0112	20.0058 (88)
util rest of house	0.9806	0.9718	0.9539	0.9122	0.8259	0.6690	0.4930	0.5397	0.7739	0.9244	0.9703	0.9833 (89)
MIT 2	18.1365	18.3314	18.6738	19.1484	19.5733	19.8831	19.9905	19.9790	19.7728	19.2417	18.6248	18.1169 (90)
Living area fraction	18.3248	18.5196	18.8624	19.3370	19.7664	20.0832	20.1991	20.1849	19.9675	19.4291	18.8109	18.3033 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.1748	18.3696	18.7124	19.1870	19.6164	19.9332	20.0491	20.0349	19.8175	19.2791	18.6609	18.1533 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	426.8335	467.3218	495.1555	506.4588	477.5977	380.4153	271.4365	279.7336	369.3643	407.1955	405.3866	408.0353 (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	1214.2518	1174.9806	1061.9245	881.0944	676.1209	449.4385	290.6638	305.5552	484.3231	741.2608	993.0889	1205.7951 (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	585.8392	475.5467	421.6761	269.7376	147.7013	0.0000	0.0000	0.0000	0.0000	248.5446	423.1456	593.5333 (98)
Space heating												3165.7245 (98)
Space heating per m2												40.0725 (99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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 %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3498.0381 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	585.8392	475.5467	421.6761	269.7376	147.7013	0.0000	0.0000	0.0000	0.0000	248.5446	423.1456	593.5333	(98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)
Space heating fuel (main heating system)	647.3361	525.4659	465.9404	298.0526	163.2059	0.0000	0.0000	0.0000	0.0000	274.6349	467.5643	655.8379	(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	165.1296	144.8215	150.3939	132.4676	128.1087	112.0274	105.2777	118.7220	119.5232	137.4893	148.3346	160.3678	(64)
Efficiency of water heater (217)m	89.7764	89.7322	89.6362	89.4205	88.9850	87.3000	87.3000	87.3000	87.3000	89.3337	89.6471	89.7998	(217)
Fuel for water heating, kWh/month	183.9344	161.3931	167.7825	148.1401	143.9667	128.3246	120.5930	135.9931	136.9109	153.9052	165.4651	178.5837	(219)
Water heating fuel used													1824.9924 (219)
Annual totals kWh/year													
Space heating fuel - main system													3498.0381 (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)													404.0250 (232)
Total delivered energy for all uses													5802.0555 (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	3498.0381	0.2160	755.5762 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1824.9924	0.2160	394.1984 (264)
Space and water heating			1149.7746 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	404.0250	0.5190	209.6890 (268)
Total CO2, kg/year			1398.3886 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			17.7000 (273)

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

DER			17.7000 ZC1
Total Floor Area		TFA	79.0000
Assumed number of occupants		N	2.4436
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			16.3025 ZC2
CO2 emissions from cooking, equation (L16)			2.2487 ZC3
Total CO2 emissions			36.2512 ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000 ZC5
Additional allowable electricity generation, kWh/m ² /year			0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000 ZC7
Net CO2 emissions			36.2512 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	39.5000 (1b)	x 2.3300 (2b)	= 92.0350 (1b) - (3b)
First floor	39.5000 (1c)	x 2.5300 (2c)	= 99.9350 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.0000		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 191.9700 (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				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) =	0.1563 (8)							
Pressure test					Yes							
Measured/design AP50					5.0000							
Infiltration rate					0.4063 (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) =		0.3758 (21)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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	0.4791	0.4698	0.4604	0.4134	0.4040	0.3570	0.3570	0.3476	0.3758	0.4040	0.4228	0.4416 (22b)
Effective ac	0.6148	0.6103	0.6060	0.5854	0.5816	0.5637	0.5637	0.5604	0.5706	0.5816	0.5894	0.5975 (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			4.2000	1.0000	4.2000		(26)					
TER Opening Type (Uw = 1.40)			6.8900	1.3258	9.1345		(27)					
Flr - Ground			39.5020	0.1300	5.1353		(28a)					
Wl - Brick	86.7660	11.0940	75.6720	0.1800	13.6210		(29a)					
RF - Ins Joist	39.5020		39.5020	0.1300	5.1353		(30)					
Total net area of external elements Aum(A, m2)			165.7660				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =		37.2259 (33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.7835 (36)					
Total fabric heat loss							(33) + (36) = 46.0094 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 38.9472	Feb 38.6648	Mar 38.3880	Apr 37.0879	May 36.8446	Jun 35.7123	Jul 35.7123	Aug 35.5026	Sep 36.1485	Oct 36.8446	Nov 37.3367	Dec 37.8512 (38)
Heat transfer coeff	84.9566	84.6742	84.3974	83.0973	82.8541	81.7218	81.7218	81.5121	82.1579	82.8541	83.3462	83.8606 (39)
Average = Sum(39)m / 12 =												83.0962 (39)
HLP	Jan 1.0754	Feb 1.0718	Mar 1.0683	Apr 1.0519	May 1.0488	Jun 1.0345	Jul 1.0345	Aug 1.0318	Sep 1.0400	Oct 1.0488	Nov 1.0550	Dec 1.0615 (40)
HLP (average)												1.0519 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.4436 (42)
Average daily hot water use (litres/day)												92.2358 (43)
Daily hot water use	101.4594	97.7700	94.0805	90.3911	86.7017	83.0122	83.0122	86.7017	90.3911	94.0805	97.7700	101.4594 (44)
Energy conte	150.4613	131.5945	135.7937	118.3882	113.5963	98.0250	90.8346	104.2340	105.4789	122.9255	134.1828	145.7138 (45)
Energy content (annual)												Total = Sum(45)m = 1451.2285 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:	22.5692	19.7392	20.3691	17.7582	17.0394	14.7037	13.6252	15.6351	15.8218	18.4388	20.1274	21.8571 (46)
Total storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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													3371.2912 (211)
Space heating requirement	587.7763	478.3875	423.7548	265.5892	133.1213	0.0000	0.0000	0.0000	0.0000	242.0820	422.7492	595.3256	(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)	629.3108	512.1922	453.6989	284.3568	142.5282	0.0000	0.0000	0.0000	0.0000	259.1885	452.6223	637.3936	(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	201.4203	176.5954	183.7361	162.9647	157.7785	138.9625	133.1367	148.4162	150.0553	170.8679	182.3981	196.6727	(64)
Efficiency of water heater (217)m	87.5883	87.4349	87.0871	86.2736	84.6268	80.3000	80.3000	80.3000	80.3000	85.9280	87.0980	87.6620	(216)
Fuel for water heating, kWh/month	229.9625	201.9736	210.9798	188.8929	186.4404	173.0542	165.7991	184.8272	186.8684	198.8501	209.4170	224.3535	(219)
Water heating fuel used													2361.4186 (219)
Annual totals kWh/year													
Space heating fuel - main system													3371.2912 (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)													406.2828 (232)
Total delivered energy for all uses													6213.9926 (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	3371.2912	0.2160	728.1989 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2361.4186	0.2160	510.0664 (264)
Space and water heating			1238.2653 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	406.2828	0.5190	210.8608 (268)
Total CO2, kg/m2/year			1488.0511 (272)
Emissions per m2 for space and water heating			15.6742 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.6691 (272b)
Emissions per m2 for pumps and fans			0.4927 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.6742 * 1.00) + 2.6691 + 0.4927, rounded to 2 d.p.			18.8400 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	39.5000 (1b)	2.3300 (2b)	92.0350 (1b) - (3b)
First floor	39.5000 (1c)	2.5300 (2c)	99.9350 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.0000		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 191.9700 (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				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) =	0.1563 (8)							
Pressure test					Yes							
Measured/design AP50					5.0100							
Infiltration rate					0.4068 (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) =	0.3763 (21)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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	0.4797	0.4703	0.4609	0.4139	0.4045	0.3575	0.3575	0.3480	0.3763	0.4045	0.4233	0.4421 (22b)
Effective ac	0.6151	0.6106	0.6062	0.5857	0.5818	0.5639	0.5639	0.5606	0.5708	0.5818	0.5896	0.5977 (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					
Windows (Uw = 1.30)			6.8900	1.2357	8.5143		(27)					
Solid Door			4.2000	1.2000	5.0400		(26)					
Flr - Ground			39.5020	0.2200	8.6904	75.6000	2986.3512 (28a)					
Wl - Brick	86.7660	11.0940	75.6720	0.2400	18.1613	38.9400	2946.6677 (29a)					
RF - Ins Joist	39.5020		39.5020	0.1000	3.9502	5.8200	229.9016 (30)					
Total net area of external elements Aum(A, m2)			165.7660				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.3562		(33)					
Party Wall			39.3810	0.0000	0.0000	54.0300	2127.7554 (32)					
Ground Floor Stud			52.6653			5.8200	306.5120 (32c)					
1st Floor Stud			86.0394			5.8200	500.7495 (32c)					
Internal Floor			39.5000			18.0000	711.0000 (32d)					
Internal Ceiling			39.5000			5.8200	229.8900 (32e)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	10038.8275 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							127.0738 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.1937 (36)					
Total fabric heat loss						(33) + (36) =	48.5499 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 38.9651	Feb 38.6820	Mar 38.4045	Apr 37.1012	May 36.8574	Jun 35.7223	Jul 35.7223	Aug 35.5120	Sep 36.1595	Oct 36.8574	Nov 37.3507	Dec 37.8664 (38)
Heat transfer coeff	87.5150	87.2319	86.9544	85.6511	85.4073	84.2722	84.2722	84.0620	84.7094	85.4073	85.9006	86.4163 (39)
Average = Sum(39)m / 12 =												85.6500 (39)
HLP	Jan 1.1078	Feb 1.1042	Mar 1.1007	Apr 1.0842	May 1.0811	Jun 1.0667	Jul 1.0667	Aug 1.0641	Sep 1.0723	Oct 1.0811	Nov 1.0873	Dec 1.0939 (40)
HLP (average)												1.0842 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.4436 (42)
Average daily hot water use (litres/day)												92.2358 (43)
Daily hot water use	101.4594	97.7700	94.0805	90.3911	86.7017	83.0122	83.0122	86.7017	90.3911	94.0805	97.7700	101.4594 (44)
Energy conte	150.4613	131.5945	135.7937	118.3882	113.5963	98.0250	90.8346	104.2340	105.4789	122.9255	134.1828	145.7138 (45)
Energy content (annual)										Total = Sum(45)m =		1451.2285 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	736.5084	704.8039	669.2455	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												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	111.7713	150.1281	127.1917	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												389.0911 (104)
Cooled fraction												1.0000 (105)
Intermittency factor (Table 10b)												
Intermittency factor	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												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	27.9428	37.5320	31.7979	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												97.2728 (107)
Space cooling per m2												1.2313 (108)
Energy for space heating												42.3934 (99)
Energy for space cooling												1.2313 (108)
Total												43.6247 (109)
Dwelling Fabric Energy Efficiency (DFEE)												43.6 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	39.5000 (1b)	x 2.3300 (2b)	= 92.0350 (1b) - (3b)
First floor	39.5000 (1c)	x 2.5300 (2c)	= 99.9350 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 191.9700 (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) = 0.1563 (8)							
Pressure test					Yes							
Measured/design AP50					5.0000							
Infiltration rate					0.4063 (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) =	0.3758 (21)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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 infiltr rate	0.4791	0.4698	0.4604	0.4134	0.4040	0.3570	0.3570	0.3476	0.3758	0.4040	0.4228	0.4416 (22b)
Effective ac	0.6148	0.6103	0.6060	0.5854	0.5816	0.5637	0.5637	0.5604	0.5706	0.5816	0.5894	0.5975 (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			4.2000	1.0000	4.2000		(26)					
TER Opening Type (Uw = 1.40)			6.8900	1.3258	9.1345		(27)					
Flr - Ground			39.5020	0.1300	5.1353		(28a)					
Wl - Brick	86.7660	11.0940	75.6720	0.1800	13.6210		(29a)					
RF - Ins Joist	39.5020		39.5020	0.1300	5.1353		(30)					
Total net area of external elements Aum(A, m2)			165.7660				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	37.2259	(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.7835 (36)					
Total fabric heat loss						(33) + (36) =	46.0094 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 38.9472	Feb 38.6648	Mar 38.3880	Apr 37.0879	May 36.8446	Jun 35.7123	Jul 35.7123	Aug 35.5026	Sep 36.1485	Oct 36.8446	Nov 37.3367	Dec 37.8512 (38)
Heat transfer coeff	84.9566	84.6742	84.3974	83.0973	82.8541	81.7218	81.7218	81.5121	82.1579	82.8541	83.3462	83.8606 (39)
Average = Sum(39)m / 12 =												83.0962 (39)
HLP	Jan 1.0754	Feb 1.0718	Mar 1.0683	Apr 1.0519	May 1.0488	Jun 1.0345	Jul 1.0345	Aug 1.0318	Sep 1.0400	Oct 1.0488	Nov 1.0550	Dec 1.0615 (40)
HLP (average)												1.0519 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.4436 (42)
Average daily hot water use (litres/day)												92.2358 (43)
Daily hot water use	101.4594	97.7700	94.0805	90.3911	86.7017	83.0122	83.0122	86.7017	90.3911	94.0805	97.7700	101.4594 (44)
Energy conte	150.4613	131.5945	135.7937	118.3882	113.5963	98.0250	90.8346	104.2340	105.4789	122.9255	134.1828	145.7138 (45)
Energy content (annual)												Total = Sum(45)m = 1451.2285 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
If cylinder contains dedicated solar storage												0.0000 (56)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	12.6115	21.8274	17.4659	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling												51.9048 (107)
Space cooling per m2												0.6570 (108)
Energy for space heating												43.9779 (99)
Energy for space cooling												0.6570 (108)
Total												44.6349 (109)
Target Fabric Energy Efficiency (TFEE)												51.3 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
 CALCULATION OF HEAT DEMAND 09 Jan 2014

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	39.5000 (1b)	2.3300 (2b)	92.0350 (1b) - (3b)
First floor	39.5000 (1c)	2.5300 (2c)	99.9350 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.0000		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 191.9700 (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				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) =	0.1563 (8)							
Pressure test					Yes							
Measured/design AP50					5.0100							
Infiltration rate					0.4068 (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) =		0.3763 (21)							
Wind speed	Jan 4.9000	Feb 4.6000	Mar 4.7000	Apr 4.3000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 3.8000	Oct 4.3000	Nov 4.3000	Dec 4.6000 (22)
Wind factor	1.2250	1.1500	1.1750	1.0750	1.0750	0.9500	0.9500	0.9250	0.9500	1.0750	1.0750	1.1500 (22a)
Adj infilt rate												
Effective ac	0.4609	0.4327	0.4421	0.4045	0.4045	0.3575	0.3575	0.3480	0.3575	0.4045	0.4045	0.4327 (22b)
	0.6062	0.5936	0.5977	0.5818	0.5818	0.5639	0.5639	0.5606	0.5639	0.5818	0.5818	0.5936 (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					
Windows (Uw = 1.30)			6.8900	1.2357	8.5143		(27)					
Solid Door			4.2000	1.2000	5.0400		(26)					
Flr - Ground			39.5020	0.2200	8.6904	75.6000	2986.3512 (28a)					
Wl - Brick	86.7660	11.0940	75.6720	0.2400	18.1613	38.9400	2946.6677 (29a)					
RF - Ins Joist	39.5020		39.5020	0.1000	3.9502	5.8200	229.9016 (30)					
Total net area of external elements Aum(A, m2)			165.7660				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.3562		(33)					
Party Wall			39.3810	0.0000	0.0000	54.0300	2127.7554 (32)					
Ground Floor Stud			52.6653			5.8200	306.5120 (32c)					
1st Floor Stud			86.0394			5.8200	500.7495 (32c)					
Internal Floor			39.5000			18.0000	711.0000 (32d)					
Internal Ceiling			39.5000			5.8200	229.8900 (32e)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	10038.8275 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							127.0738 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.1937 (36)					
Total fabric heat loss						(33) + (36) =	48.5499 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 38.4045	Feb 37.6057	Mar 37.8664	Apr 36.8574	May 36.8574	Jun 35.7223	Jul 35.7223	Aug 35.5120	Sep 35.7223	Oct 36.8574	Nov 36.8574	Dec 37.6057 (38)
Heat transfer coeff	86.9544	86.1556	86.4163	85.4073	85.4073	84.2722	84.2722	84.0620	84.2722	85.4073	85.4073	86.1556 (39)
Average = Sum(39)m / 12 =												85.3491 (39)
HLP	Jan 1.1007	Feb 1.0906	Mar 1.0939	Apr 1.0811	May 1.0811	Jun 1.0667	Jul 1.0667	Aug 1.0641	Sep 1.0667	Oct 1.0811	Nov 1.0811	Dec 1.0906 (40)
HLP (average)												1.0804 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.4436 (42)
Average daily hot water use (litres/day)												92.2358 (43)
Daily hot water use	101.4594	97.7700	94.0805	90.3911	86.7017	83.0122	83.0122	86.7017	90.3911	94.0805	97.7700	101.4594 (44)
Energy conte	150.4613	131.5945	135.7937	118.3882	113.5963	98.0250	90.8346	104.2340	105.4789	122.9255	134.1828	145.7138 (45)
Energy content (annual)										Total = Sum(45)m =		1451.2285 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	22.5692	19.7392	20.3691	17.7582	17.0394	14.7037	13.6252	15.6351	15.8218	18.4388	20.1274	21.8571 (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	14.6683	13.2271	14.6002	14.0793	14.5124	14.0024	14.4431	14.4880	14.0443	14.5639	14.1519	14.6541 (61)
Total heat required for water heating calculated for each month	165.1296	144.8215	150.3939	132.4676	128.1087	112.0274	105.2777	118.7220	119.5232	137.4893	148.3346	160.3678 (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	165.1296	144.8215	150.3939	132.4676	128.1087	112.0274	105.2777	118.7220	119.5232	137.4893	148.3346	160.3678 (64)
RHI water heating demand												1622.6634 (64)
Heat gains from water heating, kWh/month	53.6955	47.0619	48.8014	42.8839	41.3989	36.0939	33.8133	38.2798	38.5828	44.5137	48.1537	52.1133 (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	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	57.1939	50.7991	41.3126	31.2763	23.3794	19.7379	21.3275	27.7223	37.2088	47.2451	55.1420	58.7835 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	324.3849	327.7510	319.2685	301.2103	278.4152	256.9909	242.6782	239.3121	247.7945	265.8527	288.6479	310.0721 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053 (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)	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445 (71)
Water heating gains (Table 5)	72.1713	70.0326	65.5933	59.5610	55.6436	50.1304	45.4479	51.4514	53.5872	59.8302	66.8802	70.0448 (72)
Total internal gains	557.7277	552.5603	530.1520	496.0252	461.4158	430.8368	413.4312	422.4633	442.5681	476.9055	514.6476	542.8780 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d	Gains W				
Southeast	3.5280	43.0593	0.7600	0.7200	0.7700	57.6069 (77)						
Northwest	3.3620	13.7804	0.7600	0.7200	0.7700	17.5687 (81)						
Solar gains	75.1756	119.1579	178.1568	250.5305	286.0469	317.0056	290.5942	255.5335	208.1869	139.2459	8.9774	61.5398 (83)
Total gains	632.9033	671.7182	708.3088	746.5557	747.4627	747.8424	704.0253	677.9967	650.7550	616.1514	523.6250	604.4179 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation factor for gains for living area, nil,m (see Table 9a)	tau	32.0693	32.3666	32.2690	32.6502	32.6502	33.0900	33.0900	33.1727	33.0900	32.6502	32.6502
alpha	3.1380	3.1578	3.1513	3.1767	3.1767	3.2060	3.2060	3.2115	3.2060	3.1767	3.1767	3.1578
util living area	0.9529	0.9416	0.9140	0.8577	0.7627	0.5988	0.4831	0.4976	0.6994	0.8646	0.9512	0.9577 (86)
MIT	19.4271	19.5743	19.8875	20.2874	20.6396	20.8846	20.9556	20.9519	20.7984	20.3790	19.7505	19.3998 (87)
Th 2	20.0003	20.0085	20.0058	20.0163	20.0163	20.0281	20.0281	20.0303	20.0281	20.0163	20.0163	20.0085 (88)
util rest of house	0.9449	0.9318	0.8988	0.8316	0.7160	0.5229	0.3856	0.3984	0.6314	0.8341	0.9409	0.9504 (89)
MIT 2	18.5890	18.7389	19.0421	19.4317	19.7534	19.9628	20.0101	20.0107	19.9016	19.5247	18.9229	18.5688 (90)
Living area fraction	18.7780	18.9273	19.2328	19.6247	19.9533	20.1708	20.2234	20.2230	20.1039	19.7174	19.1096	18.7562 (92)
Temperature adjustment	18.6280	18.7773	19.0828	19.4747	19.8033	20.0208	20.0734	20.0730	19.9539	19.5674	18.9596	18.6062 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	589.1318	615.6825	624.5136	608.3161	526.7013	390.5548	274.8159	273.2433	407.1285	503.7505	485.2868	566.4779 (95)
Ext temp.	4.9000	5.3000	7.0000	9.3000	12.2000	15.0000	16.7000	16.7000	14.4000	11.1000	7.8000	4.9000 (96)
Heat loss rate W	1193.7124	1161.1452	1044.1484	868.9957	649.3774	423.1117	284.2823	283.5388	468.0405	723.1794	953.1116	1180.8691 (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	449.8080	366.5509	312.2083	187.6893	91.2711	0.0000	0.0000	0.0000	0.0000	163.2551	336.8338	457.1071 (98)
Space heating												2364.7236 (98)
RHI space heating demand												2365 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (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	39.5000 (1b)	2.3300 (2b)	92.0350 (1b) - (3b)
First floor	39.5000 (1c)	2.5300 (2c)	99.9350 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.0000		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 191.9700 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ 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				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) =	0.1563 (8)							
Pressure test					Yes							
Measured/design AP50					5.0100							
Infiltration rate					0.4068 (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) =		0.3763 (21)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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												
Effective ac	0.4797	0.4703	0.4609	0.4139	0.4045	0.3575	0.3575	0.3480	0.3763	0.4045	0.4233	0.4421 (22b)
	0.6151	0.6106	0.6062	0.5857	0.5818	0.5639	0.5639	0.5606	0.5708	0.5818	0.5896	0.5977 (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					
Windows (Uw = 1.30)			6.8900	1.2357	8.5143		(27)					
Solid Door			4.2000	1.2000	5.0400		(26)					
Flr - Ground			39.5020	0.2200	8.6904	75.6000	2986.3512 (28a)					
Wl - Brick	86.7660	11.0940	75.6720	0.2400	18.1613	38.9400	2946.6677 (29a)					
RF - Ins Joist	39.5020		39.5020	0.1000	3.9502	5.8200	229.9016 (30)					
Total net area of external elements Aum(A, m ²)			165.7660				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.3562		(33)					
Party Wall			39.3810	0.0000	0.0000	54.0300	2127.7554 (32)					
Ground Floor Stud			52.6653			5.8200	306.5120 (32c)					
1st Floor Stud			86.0394			5.8200	500.7495 (32c)					
Internal Floor			39.5000			18.0000	711.0000 (32d)					
Internal Ceiling			39.5000			5.8200	229.8900 (32e)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	10038.8275 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							127.0738 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.1937 (36)					
Total fabric heat loss						(33) + (36) =	48.5499 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 38.9651	Feb 38.6820	Mar 38.4045	Apr 37.1012	May 36.8574	Jun 35.7223	Jul 35.7223	Aug 35.5120	Sep 36.1595	Oct 36.8574	Nov 37.3507	Dec 37.8664 (38)
Heat transfer coeff	87.5150	87.2319	86.9544	85.6511	85.4073	84.2722	84.2722	84.0620	84.7094	85.4073	85.9006	86.4163 (39)
Average = Sum(39)m / 12 =												85.6500 (39)
HLP	Jan 1.1078	Feb 1.1042	Mar 1.1007	Apr 1.0842	May 1.0811	Jun 1.0667	Jul 1.0667	Aug 1.0641	Sep 1.0723	Oct 1.0811	Nov 1.0873	Dec 1.0939 (40)
HLP (average)												1.0842 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.4436 (42)
Average daily hot water use (litres/day)												92.2358 (43)
Daily hot water use	101.4594	97.7700	94.0805	90.3911	86.7017	83.0122	83.0122	86.7017	90.3911	94.0805	97.7700	101.4594 (44)
Energy conte	150.4613	131.5945	135.7937	118.3882	113.5963	98.0250	90.8346	104.2340	105.4789	122.9255	134.1828	145.7138 (45)
Energy content (annual)												Total = Sum(45)m = 1451.2285 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	22.5692	19.7392	20.3691	17.7582	17.0394	14.7037	13.6252	15.6351	15.8218	18.4388	20.1274	21.8571 (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	14.6683	13.2271	14.6002	14.0793	14.5124	14.0024	14.4431	14.4880	14.0443	14.5639	14.1519	14.6541 (61)
Total heat required for water heating calculated for each month	165.1296	144.8215	150.3939	132.4676	128.1087	112.0274	105.2777	118.7220	119.5232	137.4893	148.3346	160.3678 (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	165.1296	144.8215	150.3939	132.4676	128.1087	112.0274	105.2777	118.7220	119.5232	137.4893	148.3346	160.3678 (64)
Heat gains from water heating, kWh/month	53.6955	47.0619	48.8014	42.8839	41.3989	36.0939	33.8133	38.2798	38.5828	44.5137	48.1537	52.1133 (65)
												Total per year (kWh/year) = Sum(64)m = 1622.6634 (64)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	57.1939	50.7991	41.3126	31.2763	23.3794	19.7379	21.3275	27.7223	37.2088	47.2451	55.1420	58.7835 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	324.3849	327.7510	319.2685	301.2103	278.4152	256.9909	242.6782	239.3121	247.7945	265.8527	288.6479	310.0721 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053 (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)	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445 (71)
Water heating gains (Table 5)	72.1713	70.0326	65.5933	59.5610	55.6436	50.1304	45.4479	51.4514	53.5872	59.8302	66.8802	70.0448 (72)
Total internal gains	557.7277	552.5603	530.1520	496.0252	461.4158	430.8368	413.4312	422.4633	442.5681	476.9055	514.6476	542.8780 (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						
Southeast	3.5280	36.7938	0.7600	0.7200	0.7700	49.2247 (77)						
Northwest	3.3620	11.2829	0.7600	0.7200	0.7700	14.3847 (81)						
Solar gains	63.6093	113.1282	167.4782	228.7860	275.6759	282.2230	268.5389	232.2512	188.5036	128.4527	77.0594	53.8733 (83)
Total gains	621.3370	665.6885	697.6302	724.8112	737.0917	713.0598	681.9701	654.7145	631.0717	605.3582	591.7070	596.7513 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	31.8638	31.9672	32.0693	32.5572	32.6502	33.0900	33.0900	33.1727	32.9192	32.6502	32.4627	32.2690
alpha	3.1243	3.1311	3.1380	3.1705	3.1767	3.2060	3.2060	3.2115	3.1946	3.1767	3.1642	3.1513
util living area	0.9591	0.9468	0.9237	0.8751	0.7882	0.6474	0.5056	0.5406	0.7316	0.8820	0.9422	0.9633 (86)
MIT	19.2952	19.4736	19.7833	20.2024	20.5764	20.8451	20.9482	20.9347	20.7556	20.2965	19.7386	19.2656 (87)
Th 2	19.9945	19.9974	20.0003	20.0138	20.0163	20.0281	20.0281	20.0303	20.0235	20.0163	20.0112	20.0058 (88)
util rest of house	0.9523	0.9379	0.9103	0.8520	0.7463	0.5760	0.4076	0.4438	0.6683	0.8556	0.9311	0.9572 (89)
MIT 2	18.4546	18.6318	18.9367	19.3504	19.6982	19.9349	20.0064	20.0011	19.8643	19.4479	18.9050	18.4341 (90)
Living area fraction	18.6442	18.8217	19.1277	19.5426	19.8963	20.1402	20.2188	20.2117	20.0653	19.6393	19.0931	18.6217 (92)
Temperature adjustment	18.4942	18.6717	18.9777	19.3926	19.7463	19.9902	20.0688	20.0617	19.9153	19.4893	18.9431	-0.1500
adjusted MIT												18.4717 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9391	0.9231	0.8936	0.8347	0.7333	0.5729	0.4120	0.4471	0.6605	0.8386	0.9159	0.9449 (94)
Ext temp.	583.5071	614.4805	623.3971	605.0358	540.5019	408.5435	280.9531	292.7319	416.8004	507.6743	541.9335	563.8730 (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	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	490.0736	394.3611	343.4257	211.4417	109.1554	0.0000	0.0000	0.0000	0.0000	187.1452	342.2825	498.0563 (98)
Space heating per m2												2575.9415 (98)
												(98) / (4) = 32.6069 (99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Not applicable

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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 %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2846.3442 (211)
Space heating requirement	490.0736	394.3611	343.4257	211.4417	109.1554	0.0000	0.0000	0.0000	0.0000	187.1452	342.2825	498.0563	(98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)
Space heating fuel (main heating system)	541.5178	435.7581	379.4760	233.6373	120.6137	0.0000	0.0000	0.0000	0.0000	206.7902	378.2127	550.3384	(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	165.1296	144.8215	150.3939	132.4676	128.1087	112.0274	105.2777	118.7220	119.5232	137.4893	148.3346	160.3678	(64)
Efficiency of water heater (217)m	89.6716	89.6177	89.5009	89.2400	88.7436	87.3000	87.3000	87.3000	87.3000	89.1165	89.5080	89.6992	(217)
Fuel for water heating, kWh/month	184.1493	161.5993	168.0362	148.4396	144.3582	128.3246	120.5930	135.9931	136.9109	154.2804	165.7221	178.7841	(219)
Water heating fuel used													1827.1909 (219)
Annual totals kWh/year													
Space heating fuel - main system													2846.3442 (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)													404.0250 (232)
Total delivered energy for all uses													5152.5601 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2846.3442	3.4800	99.0528 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1827.1909	3.4800	63.5862 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	404.0250	13.1900	53.2909 (250)
Additional standing charges			120.0000 (251)
Total energy cost			345.8224 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.1713 (257)
SAP value		83.6599
SAP rating (Section 12)		84 (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	2846.3442	0.2160	614.8103 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1827.1909	0.2160	394.6732 (264)
Space and water heating			1009.4836 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	404.0250	0.5190	209.6890 (268)
Total kg/year			1258.0975 (272)
CO2 emissions per m2			15.9300 (273)
EI value			86.4044
EI rating			86 (274)
EI band			B

Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9050 = 3.845$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9050 = 0.2387$, stars = 4
Water heating energy efficiency	$3.48 / 0.8869 = 3.924$, stars = 4
Water heating environmental impact	$0.216 / 0.8869 = 0.2435$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	39.5000 (1b)	2.3300 (2b)	92.0350 (1b) - (3b)
First floor	39.5000 (1c)	2.5300 (2c)	99.9350 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.0000		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 191.9700 (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				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) =	0.1563 (8)							
Pressure test					Yes							
Measured/design AP50					5.0100							
Infiltration rate					0.4068 (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) =		0.3763 (21)							
Wind speed	Jan 4.9000	Feb 4.6000	Mar 4.7000	Apr 4.3000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 3.8000	Oct 4.3000	Nov 4.3000	Dec 4.6000 (22)
Wind factor	1.2250	1.1500	1.1750	1.0750	1.0750	0.9500	0.9500	0.9250	0.9500	1.0750	1.0750	1.1500 (22a)
Adj infilt rate												
Effective ac	0.4609	0.4327	0.4421	0.4045	0.4045	0.3575	0.3575	0.3480	0.3575	0.4045	0.4045	0.4327 (22b)
	0.6062	0.5936	0.5977	0.5818	0.5818	0.5639	0.5639	0.5606	0.5639	0.5818	0.5818	0.5936 (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					
Windows (Uw = 1.30)			6.8900	1.2357	8.5143		(27)					
Solid Door			4.2000	1.2000	5.0400		(26)					
Flr - Ground			39.5020	0.2200	8.6904	75.6000	2986.3512 (28a)					
Wl - Brick	86.7660	11.0940	75.6720	0.2400	18.1613	38.9400	2946.6677 (29a)					
RF - Ins Joist	39.5020		39.5020	0.1000	3.9502	5.8200	229.9016 (30)					
Total net area of external elements Aum(A, m2)			165.7660				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.3562		(33)					
Party Wall			39.3810	0.0000	0.0000	54.0300	2127.7554 (32)					
Ground Floor Stud			52.6653			5.8200	306.5120 (32c)					
1st Floor Stud			86.0394			5.8200	500.7495 (32c)					
Internal Floor			39.5000			18.0000	711.0000 (32d)					
Internal Ceiling			39.5000			5.8200	229.8900 (32e)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	10038.8275 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							127.0738 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.1937 (36)					
Total fabric heat loss						(33) + (36) =	48.5499 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 38.4045	Feb 37.6057	Mar 37.8664	Apr 36.8574	May 36.8574	Jun 35.7223	Jul 35.7223	Aug 35.5120	Sep 35.7223	Oct 36.8574	Nov 36.8574	Dec 37.6057 (38)
Heat transfer coeff	86.9544	86.1556	86.4163	85.4073	85.4073	84.2722	84.2722	84.0620	84.2722	85.4073	85.4073	86.1556 (39)
Average = Sum(39)m / 12 =												85.3491 (39)
HLP	Jan 1.1007	Feb 1.0906	Mar 1.0939	Apr 1.0811	May 1.0811	Jun 1.0667	Jul 1.0667	Aug 1.0641	Sep 1.0667	Oct 1.0811	Nov 1.0811	Dec 1.0906 (40)
HLP (average)												1.0804 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.4436 (42)
Average daily hot water use (litres/day)												92.2358 (43)
Daily hot water use	101.4594	97.7700	94.0805	90.3911	86.7017	83.0122	83.0122	86.7017	90.3911	94.0805	97.7700	101.4594 (44)
Energy conte	150.4613	131.5945	135.7937	118.3882	113.5963	98.0250	90.8346	104.2340	105.4789	122.9255	134.1828	145.7138 (45)
Energy content (annual)										Total = Sum(45)m =		1451.2285 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Distribution loss (46)m = 0.15 x (45)m	22.5692	19.7392	20.3691	17.7582	17.0394	14.7037	13.6252	15.6351	15.8218	18.4388	20.1274	21.8571 (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	14.6683	13.2271	14.6002	14.0793	14.5124	14.0024	14.4431	14.4880	14.0443	14.5639	14.1519	14.6541 (61)
Total heat required for water heating calculated for each month	165.1296	144.8215	150.3939	132.4676	128.1087	112.0274	105.2777	118.7220	119.5232	137.4893	148.3346	160.3678 (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	165.1296	144.8215	150.3939	132.4676	128.1087	112.0274	105.2777	118.7220	119.5232	137.4893	148.3346	160.3678 (64)
Heat gains from water heating, kWh/month	53.6955	47.0619	48.8014	42.8839	41.3989	36.0939	33.8133	38.2798	38.5828	44.5137	48.1537	52.1133 (65)
												Total per year (kWh/year) = Sum(64)m = 1622.6634 (64)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	57.1939	50.7991	41.3126	31.2763	23.3794	19.7379	21.3275	27.7223	37.2088	47.2451	55.1420	58.7835 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	324.3849	327.7510	319.2685	301.2103	278.4152	256.9909	242.6782	239.3121	247.7945	265.8527	288.6479	310.0721 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053 (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)	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445 (71)
Water heating gains (Table 5)	72.1713	70.0326	65.5933	59.5610	55.6436	50.1304	45.4479	51.4514	53.5872	59.8302	66.8802	70.0448 (72)
Total internal gains	557.7277	552.5603	530.1520	496.0252	461.4158	430.8368	413.4312	422.4633	442.5681	476.9055	514.6476	542.8780 (73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains						
	m ²	Table 6a	Specific data	Specific data	factor	W						
		W/m ²	or Table 6b	or Table 6c	Table 6d							
Southeast	3.5280	43.0593	0.7600	0.7200	0.7700	57.6069 (77)						
Northwest	3.3620	13.7804	0.7600	0.7200	0.7700	17.5687 (81)						
Solar gains	75.1756	119.1579	178.1568	250.5305	286.0469	317.0056	290.5942	255.5335	208.1869	139.2459	8.9774	61.5398 (83)
Total gains	632.9033	671.7182	708.3088	746.5557	747.4627	747.8424	704.0253	677.9967	650.7550	616.1514	523.6250	604.4179 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	32.0693	32.3666	32.2690	32.6502	32.6502	33.0900	33.0900	33.1727	33.0900	32.6502	32.6502	32.3666
alpha	3.1380	3.1578	3.1513	3.1767	3.1767	3.2060	3.2060	3.2115	3.2060	3.1767	3.1767	3.1578
util living area	0.9529	0.9416	0.9140	0.8577	0.7627	0.5988	0.4831	0.4976	0.6994	0.8646	0.9512	0.9577 (86)
MIT	19.4271	19.5743	19.8875	20.2874	20.6396	20.8846	20.9556	20.9519	20.7984	20.3790	19.7505	19.3998 (87)
Th 2	20.0003	20.0085	20.0058	20.0163	20.0163	20.0281	20.0281	20.0303	20.0281	20.0163	20.0163	20.0085 (88)
util rest of house	0.9449	0.9318	0.8988	0.8316	0.7160	0.5229	0.3856	0.3984	0.6314	0.8341	0.9409	0.9504 (89)
MIT 2	18.5890	18.7389	19.0421	19.4317	19.7534	19.9628	20.0101	20.0107	19.9016	19.5247	18.9229	18.5688 (90)
Living area fraction	18.7780	18.9273	19.2328	19.6247	19.9533	20.1708	20.2234	20.2230	20.1039	19.7174	19.1096	18.7562 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.6280	18.7773	19.0828	19.4747	19.8033	20.0208	20.0734	20.0730	19.9539	19.5674	18.9596	18.6062 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9308	0.9166	0.8817	0.8148	0.7047	0.5222	0.3903	0.4030	0.6256	0.8176	0.9268	0.9372 (94)
Ext temp.	589.1318	615.6825	624.5136	608.3161	526.7013	390.5548	274.8159	273.2433	407.1285	503.7505	485.2868	566.4779 (95)
Heat loss rate W	4.9000	5.3000	7.0000	9.3000	12.2000	15.0000	16.7000	16.7000	14.4000	11.1000	7.8000	4.9000 (96)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	449.8080	366.5509	312.2083	187.6893	91.2711	0.0000	0.0000	0.0000	0.0000	163.2551	336.8338	457.1071 (98)
Space heating per m ²												2364.7236 (98)
												(98) / (4) = 29.9332 (99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Not applicable

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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 %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2612.9543 (211)
Space heating requirement	449.8080	366.5509	312.2083	187.6893	91.2711	0.0000	0.0000	0.0000	0.0000	163.2551	336.8338	457.1071	(98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)
Space heating fuel (main heating system)	497.0254	405.0287	344.9815	207.3915	100.8520	0.0000	0.0000	0.0000	0.0000	180.3924	372.1921	505.0907	(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	165.1296	144.8215	150.3939	132.4676	128.1087	112.0274	105.2777	118.7220	119.5232	137.4893	148.3346	160.3678	(64)
Efficiency of water heater (217)m	89.6179	89.5702	89.4342	89.1479	88.6034	87.3000	87.3000	87.3000	87.3000	89.0084	89.4970	89.6466	(217)
Fuel for water heating, kWh/month	184.2597	161.6849	168.1614	148.5930	144.5866	128.3246	120.5930	135.9931	136.9109	154.4677	165.7425	178.8890	(219)
Water heating fuel used													1828.2065 (219)
Annual totals kWh/year													
Space heating fuel - main system													2612.9543 (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)													404.0250 (232)
Total delivered energy for all uses													4920.1858 (238)

10a. Fuel costs - using BEDF prices (495)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2612.9543	3.6300	94.8502 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1828.2065	3.6300	66.3639 (247)
Pumps and fans for heating	75.0000	19.4400	14.5800 (249)
Energy for lighting	404.0250	19.4400	78.5425 (250)
Additional standing charges			95.0000 (251)
Total energy cost			349.3366 (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	2612.9543	0.2160	564.3981 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1828.2065	0.2160	394.8926 (264)
Space and water heating			959.2907 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	404.0250	0.5190	209.6890 (268)
Total kg/year			1207.9047 (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	2612.9543	1.2200	3187.8042 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1828.2065	1.2200	2230.4119 (264)
Space and water heating			5418.2162 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	404.0250	3.0700	1240.3567 (268)
Primary energy kWh/year			6888.8229 (272)
Primary energy kWh/m2/year			87.2003 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 84
 Current environmental impact rating: B 86

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

(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	Recommended
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	+ 1.2	-£ 25	-179 kg (14.9%)
U Solar photovoltaic panels	+ 10.8	-£ 354	-946 kg (92.0%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£25	2.27 kg/m ²	B 85 B 88
Solar photovoltaic panels	£354	11.98 kg/m ²	A 96 A 98
Total Savings	£379	14.25 kg/m ²	

Potential energy efficiency rating: A 96
 Potential environmental impact rating: A 98

Fuel prices for cost data on this page from database revision number 495 TEST (29 Apr 2022)
 Recommendation texts revision number 4.9c (22 Feb 2014)

Typical heating and lighting costs of this home (per year, Severn Valley):			
	Current	Potential	Saving
Electricity	£93	£103	-£10
Mains gas	£256	£222	£35
Space heating	£204	£204	£0
Water heating	£66	£42	£25
Lighting	£79	£79	£0
Generated (PV)	-£0	-£354	£354
Total cost of fuels	£349	-£29	£379
Total cost of uses	£349	-£29	£379
Delivered energy	62 kWh/m ²	28 kWh/m ²	34 kWh/m ²
Carbon dioxide emissions	1.2 tonnes	0.1 tonnes	1.1 tonnes
CO2 emissions per m ²	15 kg/m ²	1 kg/m ²	14 kg/m ²
Primary energy	87 kWh/m ²	4 kWh/m ²	84 kWh/m ²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	39.5000 (1b)	2.3300 (2b)	92.0350 (1b) - (3b)
First floor	39.5000 (1c)	2.5300 (2c)	99.9350 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.0000		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 191.9700 (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				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) =	0.1563 (8)							
Pressure test					Yes							
Measured/design AP50					5.0100							
Infiltration rate					0.4068 (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) =	0.3763 (21)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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	0.4797	0.4703	0.4609	0.4139	0.4045	0.3575	0.3575	0.3480	0.3763	0.4045	0.4233	0.4421 (22b)
Effective ac	0.6151	0.6106	0.6062	0.5857	0.5818	0.5639	0.5639	0.5606	0.5708	0.5818	0.5896	0.5977 (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					
Windows (Uw = 1.30)			6.8900	1.2357	8.5143		(27)					
Solid Door			4.2000	1.2000	5.0400		(26)					
Flr - Ground			39.5020	0.2200	8.6904	75.6000	2986.3512 (28a)					
Wl - Brick	86.7660	11.0940	75.6720	0.2400	18.1613	38.9400	2946.6677 (29a)					
RF - Ins Joist	39.5020		39.5020	0.1000	3.9502	5.8200	229.9016 (30)					
Total net area of external elements Aum(A, m2)			165.7660				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.3562		(33)					
Party Wall			39.3810	0.0000	0.0000	54.0300	2127.7554 (32)					
Ground Floor Stud			52.6653			5.8200	306.5120 (32c)					
1st Floor Stud			86.0394			5.8200	500.7495 (32c)					
Internal Floor			39.5000			18.0000	711.0000 (32d)					
Internal Ceiling			39.5000			5.8200	229.8900 (32e)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	10038.8275 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							127.0738 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.1937 (36)					
Total fabric heat loss						(33) + (36) =	48.5499 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 38.9651	Feb 38.6820	Mar 38.4045	Apr 37.1012	May 36.8574	Jun 35.7223	Jul 35.7223	Aug 35.5120	Sep 36.1595	Oct 36.8574	Nov 37.3507	Dec 37.8664 (38)
Heat transfer coeff	87.5150	87.2319	86.9544	85.6511	85.4073	84.2722	84.2722	84.0620	84.7094	85.4073	85.9006	86.4163 (39)
Average = Sum(39)m / 12 =												85.6500 (39)
HLP	Jan 1.1078	Feb 1.1042	Mar 1.1007	Apr 1.0842	May 1.0811	Jun 1.0667	Jul 1.0667	Aug 1.0641	Sep 1.0723	Oct 1.0811	Nov 1.0873	Dec 1.0939 (40)
HLP (average)												1.0842 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.4436 (42)
Average daily hot water use (litres/day)												92.2358 (43)
Daily hot water use	101.4594	97.7700	94.0805	90.3911	86.7017	83.0122	83.0122	86.7017	90.3911	94.0805	97.7700	101.4594 (44)
Energy conte	150.4613	131.5945	135.7937	118.3882	113.5963	98.0250	90.8346	104.2340	105.4789	122.9255	134.1828	145.7138 (45)
Energy content (annual)										Total = Sum(45)m =		1451.2285 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	22.5692	19.7392	20.3691	17.7582	17.0394	14.7037	13.6252	15.6351	15.8218	18.4388	20.1274	21.8571 (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	14.6683	13.2271	14.6002	14.0793	14.5124	14.0024	14.4431	14.4880	14.0443	14.5639	14.1519	14.6541 (61)
Total heat required for water heating calculated for each month	165.1296	144.8215	150.3939	132.4676	128.1087	112.0274	105.2777	118.7220	119.5232	137.4893	148.3346	160.3678 (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												1.2497 (H8)
Utilisation factor												0.5508 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												92.2358 (H14)
Volume ratio Veff/V												0.8131 (H15)
Solar storage volume factor												0.9586 (H16)
Solar input												-841.9491 (H17)
Solar input	-24.4148	-40.7414	-69.3872	-92.9925	-114.8844	-112.9497	-111.4570	-97.3806	-76.2685	-52.0824	-28.9595	-20.4311 (63)
Solar input (sum of months) = Sum(63)m =												-841.9491 (63)
Output from w/h	140.7148	104.0802	81.0067	39.4750	13.2243	0.0000	0.0000	21.3415	43.2547	85.4069	119.3751	139.9368 (64)
Total per year (kWh/year) = Sum(64)m =												787.8159 (64)
Heat gains from water heating, kWh/month	53.6955	47.0619	48.8014	42.8839	41.3989	36.0939	33.8133	38.2798	38.5828	44.5137	48.1537	52.1133 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	57.1939	50.7991	41.3126	31.2763	23.3794	19.7379	21.3275	27.7223	37.2088	47.2451	55.1420	58.7835	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	324.3849	327.7510	319.2685	301.2103	278.4152	256.9909	242.6782	239.3121	247.7945	265.8527	288.6479	310.0721	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	(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)	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	(71)
Water heating gains (Table 5)	72.1713	70.0326	65.5933	59.5610	55.6436	50.1304	45.4479	51.4514	53.5872	59.8302	66.8802	70.0448	(72)
Total internal gains	557.7277	552.5603	530.1520	496.0252	461.4158	430.8368	413.4312	422.4633	442.5681	476.9055	514.6476	542.8780	(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								
Southeast	3.5280	36.7938	0.7600	0.7200	0.7700	49.2247 (77)							
Northwest	3.3620	11.2829	0.7600	0.7200	0.7700	14.3847 (81)							
Solar gains	63.6093	113.1282	167.4782	228.7860	275.6759	282.2230	268.5389	232.2512	188.5036	128.4527	77.0594	53.8733	(83)
Total gains	621.3370	665.6885	697.6302	724.8112	737.0917	713.0598	681.9701	654.7145	631.0717	605.3582	591.7070	596.7513	(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	31.8638	31.9672	32.0693	32.5572	32.6502	33.0900	33.0900	33.1727	32.9192	32.6502	32.4627	32.2690	
alpha	3.1243	3.1311	3.1380	3.1705	3.1767	3.2060	3.2060	3.2115	3.1946	3.1767	3.1642	3.1513	
util living area	0.9591	0.9468	0.9237	0.8751	0.7882	0.6474	0.5056	0.5406	0.7316	0.8820	0.9422	0.9633	(86)
MIT	19.2952	19.4736	19.7833	20.2024	20.5764	20.8451	20.9482	20.9347	20.7556	20.2965	19.7386	19.2656	(87)
Th 2	19.9945	19.9974	20.0003	20.0138	20.0163	20.0281	20.0281	20.0303	20.0235	20.0163	20.0112	20.0058	(88)
util rest of house	0.9523	0.9379	0.9103	0.8520	0.7463	0.5760	0.4076	0.4438	0.6683	0.8556	0.9311	0.9572	(89)
MIT 2	18.4546	18.6318	18.9367	19.3504	19.6982	19.9349	20.0064	20.0011	19.8643	19.4479	18.9050	18.4341	(90)
Living area fraction									fLA = Living area / (4) =				0.2256 (91)
MIT	18.6442	18.8217	19.1277	19.5426	19.8963	20.1402	20.2188	20.2117	20.0653	19.6393	19.0931	18.6217	(92)
Temperature adjustment													-0.1500
adjusted MIT	18.4942	18.6717	18.9777	19.3926	19.7463	19.9902	20.0688	20.0617	19.9153	19.4893	18.9431	18.4717	(93)

8. Space heating requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9391	0.9231	0.8936	0.8347	0.7333	0.5729	0.4120	0.4471	0.6605	0.8386	0.9159	0.9449	(94)
Useful gains	583.5071	614.4805	623.3971	605.0358	540.5019	408.5435	280.9531	292.7319	416.8004	507.6743	541.9335	563.8730	(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	1242.2082	1201.3274	1084.9908	898.7048	687.2161	454.2441	292.3233	307.8073	492.6113	759.2135	1017.3258	1233.3035	(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	490.0736	394.3611	343.4257	211.4417	109.1554	0.0000	0.0000	0.0000	0.0000	187.1452	342.2825	498.0563	(98)
Space heating												2575.9415	(98)
Space heating per m2											(98) / (4) =	32.6069	(99)

8c. Space cooling requirement

Not applicable

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
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 %)													90.5000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													2846.3442	(211)
Space heating requirement	490.0736	394.3611	343.4257	211.4417	109.1554	0.0000	0.0000	0.0000	0.0000	187.1452	342.2825	498.0563	(98)	
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)	
Space heating fuel (main heating system)	541.5178	435.7581	379.4760	233.6373	120.6137	0.0000	0.0000	0.0000	0.0000	206.7902	378.2127	550.3384	(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	140.7148	104.0802	81.0067	39.4750	13.2243	0.0000	0.0000	21.3415	43.2547	85.4069	119.3751	139.9368	(64)	
Efficiency of water heater (217)m	89.7660	89.8126	89.8713	89.9811	90.1429	87.3000	87.3000	87.3000	87.3000	89.4723	89.6503	87.7782	(217)	
Fuel for water heating, kWh/month	156.7574	115.8860	90.1363	43.8704	14.6703	0.0000	0.0000	24.4461	49.5472	95.4563	133.1564	155.8695	(219)	
Water heating fuel used												879.7958	(219)	
Annual totals kWh/year														
Space heating fuel - main system													2846.3442	(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)
pump for solar water heating													50.0000	(230g)
Total electricity for the above, kWh/year													125.0000	(231)
Electricity for lighting (calculated in Appendix L)													404.0250	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 2.50 * 1080 * 0.80) =										-1727.2394			-1727.2394	(233)
Total delivered energy for all uses													2527.9256	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost f/year		
Space heating - main system 1	2846.3442	3.4800	99.0528	(240)	
Space heating - secondary	0.0000	0.0000	0.0000	(242)	
Water heating (other fuel)	879.7958	3.4800	30.6169	(247)	
Pumps and fans for heating	75.0000	13.1900	9.8925	(249)	
Pump for solar water heating	50.0000	13.1900	6.5950	(249)	
Energy for lighting	404.0250	13.1900	53.2909	(250)	
Additional standing charges			120.0000	(251)	
Energy saving/generation technologies					
PV Unit		-1727.2394	13.1900	-227.8229	(252)
Total energy cost			91.6252	(255)	

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200	(256)
Energy cost factor (ECF)		0.3103	(257)
SAP value	$[(255) \times (256)] / [(4) + 45.0] =$	95.6707	
SAP rating (Section 12)		96	(258)
SAP band		A	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
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FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Space heating - main system 1	2846.3442	0.2160	614.8103 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	879.7958	0.2160	190.0359 (264)
Space and water heating			804.8462 (265)
Pumps and fans	125.0000	0.5190	64.8750 (267)
Energy for lighting	404.0250	0.5190	209.6890 (268)
Energy saving/generation technologies			
PV Unit			
Total kg/year	-1727.2394	0.5190	-896.4372 (269)
CO2 emissions per m2			182.9730 (272)
EI value			2.3200 (273)
EI rating			98.0227
EI band			98 (274)
			A

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

SAP 2012 WORKSHEET FOR New Build (As Designed) (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	39.5000 (1b)	2.3300 (2b)	92.0350 (1b) - (3b)
First floor	39.5000 (1c)	2.5300 (2c)	99.9350 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.0000		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 191.9700 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ 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				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) =	0.1563 (8)							
Pressure test					Yes							
Measured/design AP50					5.0100							
Infiltration rate					0.4068 (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) =	0.3763 (21)							
Wind speed	Jan 4.9000	Feb 4.6000	Mar 4.7000	Apr 4.3000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 3.8000	Oct 4.3000	Nov 4.3000	Dec 4.6000 (22)
Wind factor	1.2250	1.1500	1.1750	1.0750	1.0750	0.9500	0.9500	0.9250	0.9500	1.0750	1.0750	1.1500 (22a)
Adj infilt rate												
Effective ac	0.4609	0.4327	0.4421	0.4045	0.4045	0.3575	0.3575	0.3480	0.3575	0.4045	0.4045	0.4327 (22b)
	0.6062	0.5936	0.5977	0.5818	0.5818	0.5639	0.5639	0.5606	0.5639	0.5818	0.5818	0.5936 (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					
Windows (Uw = 1.30)			6.8900	1.2357	8.5143		(27)					
Solid Door			4.2000	1.2000	5.0400		(26)					
Flr - Ground			39.5020	0.2200	8.6904	75.6000	2986.3512 (28a)					
Wl - Brick	86.7660	11.0940	75.6720	0.2400	18.1613	38.9400	2946.6677 (29a)					
RF - Ins Joist	39.5020		39.5020	0.1000	3.9502	5.8200	229.9016 (30)					
Total net area of external elements Aum(A, m ²)			165.7660				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.3562		(33)					
Party Wall			39.3810	0.0000	0.0000	54.0300	2127.7554 (32)					
Ground Floor Stud			52.6653			5.8200	306.5120 (32c)					
1st Floor Stud			86.0394			5.8200	500.7495 (32c)					
Internal Floor			39.5000			18.0000	711.0000 (32d)					
Internal Ceiling			39.5000			5.8200	229.8900 (32e)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	10038.8275 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							127.0738 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.1937 (36)					
Total fabric heat loss						(33) + (36) =	48.5499 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 38.4045	Feb 37.6057	Mar 37.8664	Apr 36.8574	May 36.8574	Jun 35.7223	Jul 35.7223	Aug 35.5120	Sep 35.7223	Oct 36.8574	Nov 36.8574	Dec 37.6057 (38)
Heat transfer coeff	86.9544	86.1556	86.4163	85.4073	85.4073	84.2722	84.2722	84.0620	84.2722	85.4073	85.4073	86.1556 (39)
Average = Sum(39)m / 12 =												85.3491 (39)
HLP	Jan 1.1007	Feb 1.0906	Mar 1.0939	Apr 1.0811	May 1.0811	Jun 1.0667	Jul 1.0667	Aug 1.0641	Sep 1.0667	Oct 1.0811	Nov 1.0811	Dec 1.0906 (40)
HLP (average)												1.0804 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.4436 (42)
Average daily hot water use (litres/day)												92.2358 (43)
Daily hot water use	101.4594	97.7700	94.0805	90.3911	86.7017	83.0122	83.0122	86.7017	90.3911	94.0805	97.7700	101.4594 (44)
Energy conte	150.4613	131.5945	135.7937	118.3882	113.5963	98.0250	90.8346	104.2340	105.4789	122.9255	134.1828	145.7138 (45)
Energy content (annual)										Total = Sum(45)m =		1451.2285 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Distribution loss (46)m = 0.15 x (45)m	22.5692	19.7392	20.3691	17.7582	17.0394	14.7037	13.6252	15.6351	15.8218	18.4388	20.1274	21.8571	(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	14.6683	13.2271	14.6002	14.0793	14.5124	14.0024	14.4431	14.4880	14.0443	14.5639	14.1519	14.6541	(61)
Total heat required for water heating calculated for each month	165.1296	144.8215	150.3939	132.4676	128.1087	112.0274	105.2777	118.7220	119.5232	137.4893	148.3346	160.3678	(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													1139.7099 (H5)
Overshading factor													0.8000 (H6)
Solar energy available													1914.7126 (H7)
Adjustment factor for showers													1.0000 (H7a)
Solar-to-load ratio													1.3194 (H8)
Utilisation factor													0.5314 (H9)
Collector performance factor													0.8793 (H10)
Dedicated solar storage volume													75.0000 (H11)
Effective solar volume													75.0000 (H13)
Daily hot water demand													92.2358 (H14)
Volume ratio Veff/V													0.8131 (H15)
Solar storage volume factor													0.9586 (H16)
Solar input													-857.5947 (H17)
Solar input	-28.1233	-41.7553	-71.5306	-98.1944	-114.6262	-121.9049	-115.9227	-103.1714	-81.4615	-54.8637	-3.2871	-22.7536	(63)
Solar input (sum of months) = Sum(63)m =													-857.5947 (63)
Output from w/h													
	137.0064	103.0663	78.8632	34.2731	13.4825	0.0000	0.0000	15.5506	38.0617	82.6256	145.0476	137.6142	(64)
Total per year (kWh/year) = Sum(64)m =													785.5912 (64)
Heat gains from water heating, kWh/month													
	53.6955	47.0619	48.8014	42.8839	41.3989	36.0939	33.8133	38.2798	38.5828	44.5137	48.1537	52.1133	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	57.1939	50.7991	41.3126	31.2763	23.3794	19.7379	21.3275	27.7223	37.2088	47.2451	55.1420	58.7835	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	324.3849	327.7510	319.2685	301.2103	278.4152	256.9909	242.6782	239.3121	247.7945	265.8527	288.6479	310.0721	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	(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)	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	(71)
Water heating gains (Table 5)	72.1713	70.0326	65.5933	59.5610	55.6436	50.1304	45.4479	51.4514	53.5872	59.8302	66.8802	70.0448	(72)
Total internal gains	557.7277	552.5603	530.1520	496.0252	461.4158	430.8368	413.4312	422.4633	442.5681	476.9055	514.6476	542.8780	(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							
Southeast		3.5280	43.0593	0.7600	0.7200	0.7700	57.6069 (77)						
Northwest		3.3620	13.7804	0.7600	0.7200	0.7700	17.5687 (81)						
Solar gains	75.1756	119.1579	178.1568	250.5305	286.0469	317.0056	290.5942	255.5335	208.1869	139.2459	8.9774	61.5398	(83)
Total gains	632.9033	671.7182	708.3088	746.5557	747.4627	747.8424	704.0253	677.9967	650.7550	616.1514	523.6250	604.4179	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	32.0693	32.3666	32.2690	32.6502	32.6502	33.0900	33.0900	33.1727	33.0900	32.6502	32.6502	32.3666	
alpha	3.1380	3.1578	3.1513	3.1767	3.1767	3.2060	3.2060	3.2115	3.2060	3.1767	3.1767	3.1578	
util living area	0.9529	0.9416	0.9140	0.8577	0.7627	0.5988	0.4831	0.4976	0.6994	0.8646	0.9512	0.9577	(86)
MIT	19.4271	19.5743	19.8875	20.2874	20.6396	20.8846	20.9556	20.9519	20.7984	20.3790	19.7505	19.3998	(87)
Th 2	20.0003	20.0085	20.0058	20.0163	20.0163	20.0281	20.0281	20.0303	20.0281	20.0163	20.0163	20.0085	(88)
util rest of house	0.9449	0.9318	0.8988	0.8316	0.7160	0.5229	0.3856	0.3984	0.6314	0.8341	0.9409	0.9504	(89)
MIT 2	18.5890	18.7389	19.0421	19.4317	19.7534	19.9628	20.0101	20.0107	19.9016	19.5247	18.9229	18.5688	(90)
Living area fraction									fLA = Living area / (4) =			0.2256	(91)
MIT	18.7780	18.9273	19.2328	19.6247	19.9533	20.1708	20.2234	20.2230	20.1039	19.7174	19.1096	18.7562	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.6280	18.7773	19.0828	19.4747	19.8033	20.0208	20.0734	20.0730	19.9539	19.5674	18.9596	18.6062	(93)

8. Space heating requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9308	0.9166	0.8817	0.8148	0.7047	0.5222	0.3903	0.4030	0.6256	0.8176	0.9268	0.9372	(94)
Useful gains	589.1318	615.6825	624.5136	608.3161	526.7013	390.5548	274.8159	273.2433	407.1285	503.7505	485.2868	566.4779	(95)
Ext temp.	4.9000	5.3000	7.0000	9.3000	12.2000	15.0000	16.7000	16.7000	14.4000	11.1000	7.8000	4.9000	(96)
Heat loss rate W													
Month fracti	1193.7124	1161.1452	1044.1484	868.9957	649.3774	423.1117	284.2823	283.5388	468.0405	723.1794	953.1116	1180.8691	(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	449.8080	366.5509	312.2083	187.6893	91.2711	0.0000	0.0000	0.0000	0.0000	163.2551	336.8338	457.1071	(98)
Space heating per m2										(98) / (4) =		29.9332	(99)

8c. Space cooling requirement

Not applicable

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
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 %)													90.5000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													2612.9543	(211)
Space heating requirement	449.8080	366.5509	312.2083	187.6893	91.2711	0.0000	0.0000	0.0000	0.0000	163.2551	336.8338	457.1071	(98)	
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)	
Space heating fuel (main heating system)	497.0254	405.0287	344.9815	207.3915	100.8520	0.0000	0.0000	0.0000	0.0000	180.3924	372.1921	505.0907	(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	137.0064	103.0663	78.8632	34.2731	13.4825	0.0000	0.0000	15.5506	38.0617	82.6256	145.0476	137.6142	(64)	
Efficiency of water heater (217)m	89.7321	89.7778	89.8359	89.9907	90.0750	87.3000	87.3000	87.3000	87.3000	89.3988	89.5124	87.3000	(216)	
Fuel for water heating, kWh/month	152.6839	114.8015	87.7858	38.0852	14.9680	0.0000	0.0000	17.8128	43.5987	92.4236	162.0419	153.3496	(219)	
Water heating fuel used												877.5512	(219)	
Annual totals kWh/year														
Space heating fuel - main system													2612.9543	(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)
pump for solar water heating													50.0000	(230g)
Total electricity for the above, kWh/year													125.0000	(231)
Electricity for lighting (calculated in Appendix L)													404.0250	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 2.50 * 1140 * 0.80) =										-1823.5358			-1823.5358	(233)
Total delivered energy for all uses													2195.9947	(238)

10a. Fuel costs - using BEDF prices (495)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost f/year		
Space heating - main system 1	2612.9543	3.6300	94.8502	(240)	
Space heating - secondary	0.0000	0.0000	0.0000	(242)	
Water heating (other fuel)	877.5512	3.6300	31.8551	(247)	
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	404.0250	19.4400	78.5425	(250)	
Additional standing charges			95.0000	(251)	
Energy saving/generation technologies					
PV Unit		-1823.5358	19.4400	-354.4954	(252)
Total energy cost			-29.9476	(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	2612.9543	0.2160	564.3981	(261)	
Space heating - secondary	0.0000	0.0000	0.0000	(263)	
Water heating (other fuel)	877.5512	0.2160	189.5511	(264)	
Space and water heating			753.9492	(265)	
Pumps and fans	125.0000	0.5190	64.8750	(267)	
Energy for lighting	404.0250	0.5190	209.6890	(268)	
Energy saving/generation technologies					
PV Unit		-1823.5358	0.5190	-946.4151	(269)
Total kg/year			82.0981	(272)	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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	2612.9543	1.2200	3187.8042 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	877.5512	1.2200	1070.6124 (264)
Space and water heating			4258.4167 (265)
Pumps and fans	125.0000	3.0700	383.7500 (267)
Energy for lighting	404.0250	3.0700	1240.3567 (268)
Energy saving/generation technologies			
PV Unit	-1823.5358	3.0700	-5598.2549 (269)
Primary energy kWh/year			284.2685 (272)
Primary energy kWh/m2/year			3.5983 (273)

SAP 2012 OVERHEATING ASSESSMENT FOR New Build (As Designed) 9.92

Overheating Calculation Input Data

Dwelling type	SemiDetached House
Number of storeys	2
Cross ventilation possible	Yes
SAP Region	Severn Valley
Front of dwelling faces	South East
Overshading	Average or unknown
Thermal mass parameter	127.1 (calculated from construction elements)
Night ventilation	Yes
Ventilation rate during hot weather (ach)	4.21 (Calculated rate)

Overheating Calculation

Summer ventilation heat loss coefficient	266.67 (P1)
Transmission heat loss coefficient	48.55 (37)
Summer heat loss coefficient	315.22 (P2)

Overhangs Orientation	Ratio	Z_overhangs	Overhang type
South East	0.000	1.000	None
North West	0.000	1.000	None

Solar shading Orientation	Z blinds	Solar access	Z overhangs	Z summer
South East	0.850	0.90	1.000	0.765 (P8)
North West	0.850	0.90	1.000	0.765 (P8)

[Jul]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Shading	Gains W
South East	3.5280	121.5729	0.7600	0.7200	0.7650	161.5903
North West	3.3620	100.3588	0.7600	0.7200	0.7650	127.1169
total:						288.7072

Solar gains	Jun 315	Jul 289	Aug 254	(P3/P4)
Internal gains	428	410	419	
Total summer gains	743	699	673	(P5)

Summer gain/loss ratio	2.36	2.22	2.14	(P6)
Summer external temperature	15.00	16.70	16.70	
Thermal mass temperature increment (TMP = 127.1)	1.11	1.11	1.11	
Threshold temperature	18.47	20.03	19.95	(P7)
Likelihood of high internal temperature	Not significant	Not significant	Not significant	

Assessment of likelihood of high internal temperature: Not significant

DWELLING SIGN OFF REPORT

Section 1: Dwelling Information

Dwelling Address (Please confirm final postal address and post code of the dwelling.)

House Name	<input type="text" value="Plot 287"/>	<input type="text"/>
House Number	<input type="text"/>	<input type="text"/>
Postcode	<input type="text"/>	<input type="text"/>
Street	<input type="text"/>	<input type="text"/>
Locality	<input type="text"/>	<input type="text"/>
Town	<input type="text"/>	<input type="text"/>
County	<input type="text"/>	<input type="text"/>

Dwelling Orientation (Please confirm orientation of main entrance door of the dwelling.)

Comments

Terrain Type

Property Type

Comments

Overshading (called Sunlight/shade in assessment)

Comments

Section 2: Dwelling Construction Details

Thermal Mass Parameter

Thermal Mass kJ/m²K

Comments

External Walls

Type

Construction

U-value W/m²K

Gross Area m²

Layer Name	Thickness (mm)	Conductivity (W/m.K)	Resistance (m ² K/W)	Bridging
Brick, outer leaf	102.5	0.7700	0.1331	82.81 Mortar
Insulation - 0.034	100	0.0340	2.9412	100.00
Internal Block	100	0.1100	0.9091	93.43 Mortar
Plaster Dabs	15	0.0882	0.1700	80.00 Mortar
Plasterboard	12.5	0.2100	0.0595	100.00

Comments

Party Walls

Type	Construction	U-Value (W/m ² K)	Area (m ²)
Filled Cavity with Edge Sealing	Other	0.00	39.38

DWELLING SIGN OFF REPORT

Comments

External Roofs

Type

Construction

U-value W/m²K

Gross Area m²

Layer Name	Thickness (mm)	Conductivity (W/m.K)	Resistance (m ² K/W)	Bridging
Roof space	0	0.3000	0.3000	100.00
Insulation - 0.044	300	0.0440	6.8182	100.00
Insulation - 0.044	150	0.0440	3.4091	87.20 Timber
Plasterboard	12.5	0.2100	0.0595	100.00

Comments

Heat Loss Floors

Type

Construction

U-value W/m²K

Area m²

Layer Name	Thickness (mm)	Conductivity (W/m.K)	Resistance (m ² K/W)	Bridging
Concrete, medium density	150	1.3500	0.1111	100.00
Floor Insulation - EPS	100	0.0380	2.6316	100.00
Screed	75	1.1500	0.0652	100.00

Comments

Opening Types

Description	Type	Glazing	Frame Type	U Value (W/m ² K)
Windows	Window	Double Low-E Soft 0.05		1.30
Solid Door	Solid Door			1.20
Half Glazed Door	Half Glazed Door	Double glazed		1.30
Roof Window	Roof Window	Double glazed		1.40
Door to Corridor	Door to Corridor			1.40

Comments

DWELLING SIGN OFF REPORT

Openings

Name	Opening Type	Location	Orientation	Area (m ²)
Rear	Solid Door	[1] WI - Brick	North West	2.10
Front	Solid Door	[1] WI - Brick	South East	2.10
Front	Window	[1] WI - Brick	South East	3.53
Rear	Window	[1] WI - Brick	North West	3.36

Comments

Thermal Bridging

Calculate Bridges

List of Bridges

Bridge Type	Source Type	Length (m)	Psi (W/mK)	Reference
E2 Other lintels (including other steel lintels)	Independently assessed	8.06	0.057	
E3 Sill	Independently assessed	6.06	0.009	
E4 Jamb	Independently assessed	21.45	0.014	
E5 Ground floor (normal)	Independently assessed	17.85	0.044	
E6 Intermediate floor within a dwelling	Independently assessed	17.85	0.005	
E10 Eaves (insulation at ceiling level)	Independently assessed	8.08	0.034	
E12 Gable (insulation at ceiling level)	Independently assessed	9.77	0.052	
E16 Corner (normal)	Independently assessed	9.72	0.032	
E18 Party wall between dwellings	Independently assessed	9.72	0.041	
P1 Party wall - Ground floor	Independently assessed	8.10	0.053	
P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	8.10	0.000	
P4 Party wall - Roof (insulation at ceiling level)	Independently assessed	8.10	0.072	

Y-value

0.025

W/m²K

Comments

Where specific construction details have been used documentary evidence should be provided to the SAP assessor, usually in the form of signed checklists.

Pressure Testing

Yes

As Built AP₅₀

m³/(h.m²) @ 50 Pa

Where an air pressure test has been carried out a copy of the test certificate should be forwarded to the SAP assessor.

Comments

Section 3: Dwelling Systems

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				3
Number of passive vents				0
Number of flueless gas fires				0

DWELLING SIGN OFF REPORT

Comments

Internal Lighting

Total number of light fittings

Total number of L.E.L. fittings

Percentage of L.E.L. fittings %

Comments

External Lighting

External lights fitted

Comments

Electricity Tariff

Comments

Main Heating 1

Fuel Type

Main Heating

Efficiency (Split Efficiencies) %

Brand, Model

Flue Type

Fan Assisted Flue

Heat Emitter

Flow Temperature

Comments

Heating Controls

Description

Boiler Interlock

Delayed Start Stat

Compensator

Comments

Main Heating 2

Comments

Water Heating System

DWELLING SIGN OFF REPORT

Water Heating

Main Heating 1

Supplementary Immersion

Comments

Section 4: Dwelling Renewable Energy

Section 5: Declaration

I confirm that all details provided above are accurate to the best of my knowledge.

Signed

Date