

PREDICTED ENERGY ASSESSMENT

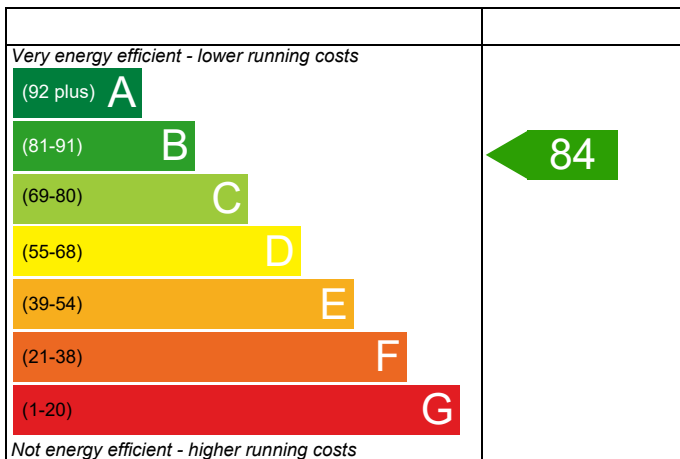
Plot 139

Dwelling type: House, Mid-Terrace
Date of assessment: 30/03/2022
Produced by: Gary Nicholls
Total floor area: 68.066 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

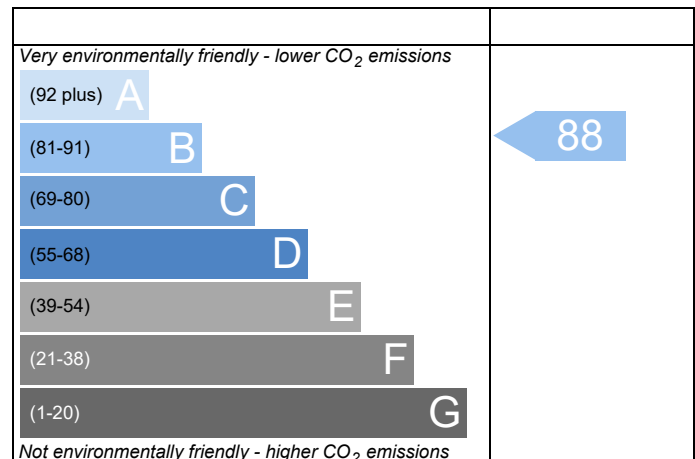


England

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	139 - PRJ009077	Issued on Date	30/03/2022
Assessment Reference	139 M	Prop Type Ref	BLO-0328
Property	Plot 139		

SAP Rating	84 B	DER	16.26	TER	17.80
Environmental	88 B	% DER<TER	8.68		
CO ₂ Emissions (t/year)	0.96	DFEE	34.64	TTEE	42.97
General Requirements Compliance	Pass	% DFEE<TFEE	19.38		

Assessor Details	Chris Nicholls, , Tel: ,	Assessor ID	W947-0001
Client			

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 (m ²)	Storey height (m)	Volume (m ³)
Ground floor	34.0330 (1b)	x 2.3260 (2b)	= 79.1608 (1b) - (3b)
First floor	34.0330 (1c)	x 2.5340 (2c)	= 86.2396 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.0660		
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 165.4004 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour							
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)							
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)							
Number of intermittent fans					3 * 10 = 30.0000 (7a)							
Number of passive vents					0 * 10 = 0.0000 (7b)							
Number of flueless gas fires					0 * 40 = 0.0000 (7c)							
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					30.0000 / (5) = 0.1814 (8)							
Pressure test					Yes							
Measured/design AP50					5.0100							
Infiltration rate					0.4319 (18)							
Number of sides sheltered					2 (19)							
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.8500 (20)							
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3671 (21)							
Wind speed	Jan 4.5000	Feb 4.5000	Mar 4.4000	Apr 3.9000	May 3.8000	Jun 3.4000	Jul 3.3000	Aug 3.3000	Sep 3.5000	Oct 3.8000	Nov 3.9000	Dec 4.1000 (22)
Wind factor	1.1250	1.1250	1.1000	0.9750	0.9500	0.8500	0.8250	0.8250	0.8750	0.9500	0.9750	1.0250 (22a)
Adj infilt rate	0.4130	0.4130	0.4038	0.3579	0.3487	0.3120	0.3029	0.3029	0.3212	0.3487	0.3579	0.3763 (22b)
Effective ac	0.5853	0.5853	0.5815	0.5641	0.5608	0.5487	0.5459	0.5459	0.5516	0.5608	0.5641	0.5708 (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)			7.1800	1.2357	8.8726		(27)
Solid Door			4.0600	1.2000	4.8720		(26)
Flr - Ground			34.0330	0.1800	6.1259	75.6000	2572.8948 (28a)
Wl - Brick	40.8230	11.2360	29.5870	0.2400	7.1009	38.9400	1152.1178 (29a)
RF - Ins Joist	34.0330		34.0330	0.1000	3.4033	5.8200	198.0721 (30)
Total net area of external elements Aum(A, m ²)			108.8930				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.3747		(33)
Party Wall			78.7620	0.0000	0.0000	54.0300	4255.5109 (32)
Ground Floor Stud			49.7066			5.8200	289.2925 (32c)
1st Floor Stud			79.9072			5.8200	465.0596 (32c)
Internal Floor			34.0400			18.0000	612.7200 (32d)
Internal Ceiling			34.0400			5.8200	198.1128 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	9743.7805 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							143.1519 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.3455 (36)
Total fabric heat loss						(33) + (36) =	34.7202 (37)

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

(38)m	31.9457	31.9457	31.7411	30.7872	30.6102	29.9482	29.7942	29.7942	30.1068	30.6102	30.7872	31.1550 (38)
Heat transfer coeff	66.6659	66.6659	66.4613	65.5074	65.3304	64.6684	64.5144	64.5144	64.8270	65.3304	65.5074	65.8752 (39)
Average = Sum(39)m / 12 =												65.4890 (39)
HLP	0.9794	0.9794	0.9764	0.9624	0.9598	0.9501	0.9478	0.9478	0.9524	0.9598	0.9624	0.9678 (40)
HLP (average)												0.9621 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1983 (42)
Average daily hot water use (litres/day)												86.4089 (43)
Daily hot water use	95.0498	91.5935	88.1371	84.6808	81.2244	77.7680	77.7680	81.2244	84.6808	88.1371	91.5935	95.0498 (44)
Energy content (annual)	140.9561	123.2811	127.2151	110.9092	106.4200	91.8324	85.0962	97.6491	98.8154	115.1598	125.7059	136.5085 (45)
Energy content (annual)												Total = Sum(45)m = 1359.5490 (45)
Distribution loss (46)m = 0.15 x (45)m	21.1434	18.4922	19.0823	16.6364	15.9630	13.7749	12.7644	14.6474	14.8223	17.2740	18.8559	20.4763 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
Combi loss	14.6188	13.1798	14.5533	14.0401	14.4762	13.9725	14.4154	14.4549	14.0093	14.5214	14.1037	14.6062 (61)
Total heat required for water heating calculated for each month	155.5750	136.4610	141.7684	124.9493	120.8963	105.8049	99.5117	112.1040	112.8247	129.6812	139.8096	151.1147 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	155.5750	136.4610	141.7684	124.9493	120.8963	105.8049	99.5117	112.1040	112.8247	129.6812	139.8096	151.1147 (64)
RHI water heating demand												Total per year (kWh/year) = Sum(64)m = 1530.5007 (64)
Heat gains from water heating, kWh/month	50.5226	44.2859	45.9373	40.3873	39.0037	34.0274	31.8984	36.0821	36.3584	41.9210	45.3232	49.0406 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	131.8963	131.8963	131.8963	131.8963	131.8963	131.8963	131.8963	131.8963	131.8963	131.8963	131.8963	131.8963 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	48.7516	43.3007	35.2145	26.6596	19.9284	16.8244	18.1794	23.6302	31.7164	40.2713	47.0025	50.1065 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	287.6743	290.6595	283.1370	267.1224	246.9070	227.9073	215.2143	212.2292	219.7517	235.7662	255.9817	274.9813 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.3879	50.3879	50.3879	50.3879	50.3879	50.3879	50.3879	50.3879	50.3879	50.3879	50.3879	50.3879 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-87.9308	-87.9308	-87.9308	-87.9308	-87.9308	-87.9308	-87.9308	-87.9308	-87.9308	-87.9308	-87.9308	-87.9308 (71)
Water heating gains (Table 5)	67.9068	65.9017	61.7437	56.0935	52.4243	47.2603	42.8741	48.4974	50.4978	56.3454	62.9488	65.9148 (72)
Total internal gains	501.6860	497.2152	477.4485	447.2289	416.6130	389.3453	373.6211	381.7101	399.3193	429.7362	463.2863	488.3560 (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	
North		3.3610	11.3201	0.7600	0.7200	0.7700	14.4278 (74)
South		3.8160	49.0238	0.7600	0.7200	0.7700	70.9406 (78)
Solar gains	85.3683	145.8898	198.4334	252.6476	271.2306	293.9481	271.9685
Total gains	587.0543	643.1050	675.8819	699.8765	687.8437	683.2934	645.5897
							250.3278
							222.4088
							164.7888
							114.6756
							81.0670 (83)
							621.7280
							594.5251
							577.9620
							569.4230 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	40.5996	40.5996	40.7245	41.3175	41.4295	41.8536	41.9535	41.9535	41.7512	41.4295	41.3175	41.0869
alpha	3.7066	3.7066	3.7150	3.7545	3.7620	3.7902	3.7969	3.7969	3.7834	3.7620	3.7545	3.7391
util living area	0.9536	0.9351	0.8999	0.8329	0.7337	0.5519	0.4286	0.4461	0.6529	0.8425	0.9251	0.9577 (86)
MIT	19.7898	19.9536	20.2367	20.5536	20.7882	20.9475	20.9842	20.9815	20.8945	20.5930	20.1741	19.7685 (87)
Th 2	20.1005	20.1005	20.1030	20.1148	20.1170	20.1251	20.1270	20.1270	20.1232	20.1170	20.1148	20.1102 (88)
util rest of house												
MIT	0.9458	0.9245	0.8832	0.8050	0.6886	0.4846	0.3481	0.3648	0.5906	0.8112	0.9112	0.9506 (89)
MIT 2	19.0115	19.1703	19.4455	19.7529	19.9637	20.0960	20.1208	20.1195	20.0576	19.7960	19.3986	18.9984 (90)
Living area fraction												fLA = Living area / (4) = 0.2160 (91)
MIT	19.1796	19.3395	19.6163	19.9258	20.1418	20.2799	20.3073	20.3057	20.2384	19.9681	19.5661	19.1647 (92)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF HEAT DEMAND 09 Jan 2014

Temperature adjustment
adjusted MIT 19.0296 19.1895 19.4663 19.7758 19.9918 20.1299 20.1573 20.1557 20.0884 19.8181 19.4161 -0.1500
19.0147 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9344	0.9117	0.8695	0.7930	0.6817	0.4850	0.3509	0.3676	0.5879	0.7992	0.8981	0.9398 (94)
Useful gains	548.5642	586.3121	587.6529	555.0308	468.9084	331.4086	226.5602	232.3104	365.5443	475.1698	519.0417	535.1159 (95)
Ext temp.	4.3000	4.8000	6.6000	9.0000	11.8000	14.8000	16.6000	16.5000	14.0000	10.5000	7.1000	4.2000 (96)
Heat loss rate W	981.9596	959.2866	855.1140	705.8959	535.1734	344.6750	229.4948	235.8432	394.6898	608.7556	806.7948	975.9242 (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	322.4462	250.6389	198.9911	108.6229	49.3012	0.0000	0.0000	0.0000	0.0000	99.3878	207.1822	327.9614 (98)
Space heating												1564.5316 (98)
RHI space heating demand												1565 (98)

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 (m2)	Storey height (m)	Volume (m3)
Ground floor	34.0330 (1b)	2.3260 (2b)	79.1608 (1b) - (3b)
First floor	34.0330 (1c)	2.5340 (2c)	86.2396 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.0660		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 165.4004 (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) =	0.1814 (8)							
Pressure test					Yes							
Measured/design AP50					5.0100							
Infiltration rate					0.4319 (18)							
Number of sides sheltered					2 (19)							
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)							
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3671 (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	0.4680	0.4589	0.4497	0.4038	0.3946	0.3487	0.3487	0.3396	0.3671	0.3946	0.4130	0.4313 (22b)
	0.6095	0.6053	0.6011	0.5815	0.5779	0.5608	0.5608	0.5577	0.5674	0.5779	0.5853	0.5930 (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)			7.1800	1.2357	8.8726		(27)					
Solid Door			4.0600	1.2000	4.8720		(26)					
Flr - Ground			34.0330	0.1800	6.1259	75.6000	2572.8948 (28a)					
Wl - Brick	40.8230	11.2360	29.5870	0.2400	7.1009	38.9400	1152.1178 (29a)					
RF - Ins Joist	34.0330		34.0330	0.1000	3.4033	5.8200	198.0721 (30)					
Total net area of external elements Aum(A, m2)			108.8930				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.3747		(33)					
Party Wall			78.7620	0.0000	0.0000	54.0300	4255.5109 (32)					
Ground Floor Stud			49.7066			5.8200	289.2925 (32c)					
1st Floor Stud			79.9072			5.8200	465.0596 (32c)					
Internal Floor			34.0400			18.0000	612.7200 (32d)					
Internal Ceiling			34.0400			5.8200	198.1128 (32e)					
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 9743.7805 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							143.1519 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.3455 (36)					
Total fabric heat loss							(33) + (36) = 34.7202 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 33.2697	Feb 33.0375	Mar 32.8100	Apr 31.7411	May 31.5411	Jun 30.6102	Jul 30.6102	Aug 30.4378	Sep 30.9688	Oct 31.5411	Nov 31.9457	Dec 32.3686 (38)
Heat transfer coeff	67.9899	67.7577	67.5302	66.4613	66.2614	65.3304	65.3304	65.1580	65.6890	66.2614	66.6659	67.0888 (39)
Average = Sum(39)m / 12 =												66.4604 (39)
HLP	Jan 0.9989	Feb 0.9955	Mar 0.9921	Apr 0.9764	May 0.9735	Jun 0.9598	Jul 0.9598	Aug 0.9573	Sep 0.9651	Oct 0.9735	Nov 0.9794	Dec 0.9856 (40)
HLP (average)												0.9764 (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												2.1983 (42)
Average daily hot water use (litres/day)												86.4089 (43)
Daily hot water use	95.0498	91.5935	88.1371	84.6808	81.2244	77.7680	77.7680	81.2244	84.6808	88.1371	91.5935	95.0498 (44)
Energy conte	140.9561	123.2811	127.2151	110.9092	106.4200	91.8324	85.0962	97.6491	98.8154	115.1598	125.7059	136.5085 (45)
Energy content (annual)												Total = Sum(45)m = 1359.5490 (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	21.1434	18.4922	19.0823	16.6364	15.9630	13.7749	12.7644	14.6474	14.8223	17.2740	18.8559	20.4763 (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	14.6188	13.1798	14.5533	14.0401	14.4762	13.9725	14.4154	14.4549	14.0093	14.5214	14.1037	14.6062 (61)
Total heat required for water heating calculated for each month	155.5750	136.4610	141.7684	124.9493	120.8963	105.8049	99.5117	112.1040	112.8247	129.6812	139.8096	151.1147 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	155.5750	136.4610	141.7684	124.9493	120.8963	105.8049	99.5117	112.1040	112.8247	129.6812	139.8096	151.1147 (64)
Heat gains from water heating, kWh/month	50.5226	44.2859	45.9373	40.3873	39.0037	34.0274	31.8984	36.0821	36.3584	41.9210	45.3232	49.0406 (65)
												Total per year (kWh/year) = Sum(64)m = 1530.5007 (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	131.8963	131.8963	131.8963	131.8963	131.8963	131.8963	131.8963	131.8963	131.8963	131.8963	131.8963	131.8963 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	48.7516	43.3007	35.2145	26.6596	19.9284	16.8244	18.1794	23.6302	31.7164	40.2713	47.0025	50.1065 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	287.6743	290.6595	283.1370	267.1224	246.9070	227.9073	215.2143	212.2292	219.7517	235.7662	255.9817	274.9813 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.3879	50.3879	50.3879	50.3879	50.3879	50.3879	50.3879	50.3879	50.3879	50.3879	50.3879	50.3879 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-87.9308	-87.9308	-87.9308	-87.9308	-87.9308	-87.9308	-87.9308	-87.9308	-87.9308	-87.9308	-87.9308	-87.9308 (71)
Water heating gains (Table 5)	67.9068	65.9017	61.7437	56.0935	52.4243	47.2603	42.8741	48.4974	50.4978	56.3454	62.9488	65.9148 (72)
Total internal gains	501.6860	497.2152	477.4485	447.2289	416.6130	389.3453	373.6211	381.7101	399.3193	429.7362	463.2863	488.3560 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	3.3610	10.6334	0.7600	0.7200	0.7700	13.5525 (74)
South	3.8160	46.7521	0.7600	0.7200	0.7700	67.6532 (78)
Solar gains	81.2057	136.6981	185.1473	230.2070	261.4527	261.9130
Total gains	582.8917	633.9133	662.5959	677.4359	678.0658	651.2583
						251.4772
						625.0983
						227.2999
						200.3488
						599.6681
						150.3366
						580.0729
						96.9109
						560.1972
						69.7567 (83)
						558.1127 (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	39.8089	39.9453	40.0799	40.7245	40.8474	41.4295	41.4295	41.5391	41.2033	40.8474	40.5996	40.3436
alpha	3.6539	3.6630	3.6720	3.7150	3.7232	3.7620	3.7620	3.7693	3.7469	3.7232	3.7066	3.6896
util living area	0.9554	0.9377	0.9081	0.8497	0.7491	0.5926	0.4462	0.4743	0.6679	0.8503	0.9325	0.9608 (86)
MIT	19.7422	19.9195	20.1777	20.4998	20.7628	20.9293	20.9812	20.9760	20.8842	20.5710	20.1160	19.7104 (87)
Th 2	20.0843	20.0871	20.0899	20.1030	20.1055	20.1170	20.1170	20.1191	20.1125	20.1055	20.1005	20.0953 (88)
util rest of house	0.9478	0.9273	0.8925	0.8234	0.7049	0.5250	0.3621	0.3904	0.6041	0.8194	0.9195	0.9541 (89)
MIT 2	18.9522	19.1269	19.3789	19.6944	19.9324	20.0763	20.1095	20.1090	20.0407	19.7671	19.3318	18.9300 (90)
Living area fraction	19.1228	19.2980	19.5514	19.8683	20.1118	20.2605	20.2977	20.2963	20.2229	19.9407	19.5012	19.0986 (92)
Temperature adjustment	18.9728	19.1480	19.4014	19.7183	19.9618	20.1105	20.1477	20.1463	20.0729	19.7907	19.3512	-0.1500
adjusted MIT												18.9486 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9364	0.9144	0.8786	0.8107	0.6971	0.5245	0.3651	0.3931	0.6010	0.8070	0.9065	0.9434 (94)
Ext temp.	545.8384	579.6564	582.1282	549.2055	472.6901	341.5997	228.2539	239.3772	360.4145	468.1269	507.8157	526.5397 (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	997.6015	965.4153	871.2339	719.0011	547.4351	360.0049	231.7758	244.0988	392.3537	608.9888	816.7358	989.4644 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating per m2	336.1118	259.2300	215.0947	122.2528	55.6103	0.0000	0.0000	0.0000	0.0000	104.8013	222.4225	344.4160 (98)
												1659.9393 (98)
												(98) / (4) = 24.3872 (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													1834.1870 (211)
Space heating requirement	336.1118	259.2300	215.0947	122.2528	55.6103	0.0000	0.0000	0.0000	0.0000	104.8013	222.4225	344.4160	(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)	371.3942	286.4419	237.6737	135.0860	61.4479	0.0000	0.0000	0.0000	0.0000	115.8025	245.7707	380.5701	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	155.5750	136.4610	141.7684	124.9493	120.8963	105.8049	99.5117	112.1040	112.8247	129.6812	139.8096	151.1147	(64)
Efficiency of water heater (217)m	89.4624	89.3703	89.2011	88.8538	88.2835	87.3000	87.3000	87.3000	87.3000	88.7018	89.2375	89.4996	(217)
Fuel for water heating, kWh/month	173.8999	152.6917	158.9312	140.6235	136.9409	121.1970	113.9881	128.4124	129.2379	146.1991	156.6714	168.8440	(219)
Water heating fuel used													1727.6372 (219)
Annual totals kWh/year													
Space heating fuel - main system													1834.1870 (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)													344.3872 (232)
Total delivered energy for all uses													3981.2115 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1834.1870	3.4800	63.8297 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1727.6372	3.4800	60.1218 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	344.3872	13.1900	45.4247 (250)
Additional standing charges			120.0000 (251)
Total energy cost			299.2687 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.1117 (257)
SAP value		84.4921
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	1834.1870	0.2160	396.1844 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1727.6372	0.2160	373.1696 (264)
Space and water heating			769.3540 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	344.3872	0.5190	178.7370 (268)
Total kg/year			987.0160 (272)
CO2 emissions per m2			14.5000 (273)
EI value			88.3024
EI rating			88 (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	$3.48 / 0.8848 = 3.933$, stars = 4
Water heating environmental impact	$0.216 / 0.8848 = 0.2441$, 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 (m ²)	Storey height (m)	Volume (m ³)
Ground floor	34.0330 (1b)	x 2.3260 (2b)	= 79.1608 (1b) - (3b)
First floor	34.0330 (1c)	x 2.5340 (2c)	= 86.2396 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.0660		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 165.4004 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour							
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)							
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)							
Number of intermittent fans					3 * 10 = 30.0000 (7a)							
Number of passive vents					0 * 10 = 0.0000 (7b)							
Number of flueless gas fires					0 * 40 = 0.0000 (7c)							
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					30.0000 / (5) = 0.1814 (8)							
Pressure test					Yes							
Measured/design AP50					5.0100							
Infiltration rate					0.4319 (18)							
Number of sides sheltered					2 (19)							
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)							
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3671 (21)							
Wind speed	Jan 4.5000	Feb 4.5000	Mar 4.4000	Apr 3.9000	May 3.8000	Jun 3.4000	Jul 3.3000	Aug 3.3000	Sep 3.5000	Oct 3.8000	Nov 3.9000	Dec 4.1000 (22)
Wind factor	1.1250	1.1250	1.1000	0.9750	0.9500	0.8500	0.8250	0.8250	0.8750	0.9500	0.9750	1.0250 (22a)
Adj infilt rate	0.4130	0.4130	0.4038	0.3579	0.3487	0.3120	0.3029	0.3029	0.3212	0.3487	0.3579	0.3763 (22b)
Effective ac	0.5853	0.5853	0.5815	0.5641	0.5608	0.5487	0.5459	0.5459	0.5516	0.5608	0.5641	0.5708 (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)			7.1800	1.2357	8.8726		(27)					
Solid Door			4.0600	1.2000	4.8720		(26)					
Flr - Ground			34.0330	0.1800	6.1259	75.6000	2572.8948 (28a)					
Wl - Brick	40.8230	11.2360	29.5870	0.2400	7.1009	38.9400	1152.1178 (29a)					
RF - Ins Joist	34.0330		34.0330	0.1000	3.4033	5.8200	198.0721 (30)					
Total net area of external elements Aum(A, m ²)			108.8930				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.3747		(33)					
Party Wall			78.7620	0.0000	0.0000	54.0300	4255.5109 (32)					
Ground Floor Stud			49.7066			5.8200	289.2925 (32c)					
1st Floor Stud			79.9072			5.8200	465.0596 (32c)					
Internal Floor			34.0400			18.0000	612.7200 (32d)					
Internal Ceiling			34.0400			5.8200	198.1128 (32e)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	9743.7805 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							143.1519 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.3455 (36)					
Total fabric heat loss						(33) + (36) =	34.7202 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 31.9457	Feb 31.9457	Mar 31.7411	Apr 30.7872	May 30.6102	Jun 29.9482	Jul 29.7942	Aug 29.7942	Sep 30.1068	Oct 30.6102	Nov 30.7872	Dec 31.1550 (38)
Heat transfer coeff	66.6659	66.6659	66.4613	65.5074	65.3304	64.6684	64.5144	64.5144	64.8270	65.3304	65.5074	65.8752 (39)
Average = Sum(39)m / 12 =												65.4890 (39)
HLP	Jan 0.9794	Feb 0.9794	Mar 0.9764	Apr 0.9624	May 0.9598	Jun 0.9501	Jul 0.9478	Aug 0.9478	Sep 0.9524	Oct 0.9598	Nov 0.9624	Dec 0.9678 (40)
HLP (average)												0.9621 (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												2.1983 (42)
Average daily hot water use (litres/day)												86.4089 (43)
Daily hot water use	95.0498	91.5935	88.1371	84.6808	81.2244	77.7680	77.7680	81.2244	84.6808	88.1371	91.5935	95.0498 (44)
Energy conte	140.9561	123.2811	127.2151	110.9092	106.4200	91.8324	85.0962	97.6491	98.8154	115.1598	125.7059	136.5085 (45)
Energy content (annual)										Total = Sum(45)m =		1359.5490 (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	21.1434	18.4922	19.0823	16.6364	15.9630	13.7749	12.7644	14.6474	14.8223	17.2740	18.8559	20.4763 (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	14.6188	13.1798	14.5533	14.0401	14.4762	13.9725	14.4154	14.4549	14.0093	14.5214	14.1037	14.6062 (61)
Total heat required for water heating calculated for each month	155.5750	136.4610	141.7684	124.9493	120.8963	105.8049	99.5117	112.1040	112.8247	129.6812	139.8096	151.1147 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	155.5750	136.4610	141.7684	124.9493	120.8963	105.8049	99.5117	112.1040	112.8247	129.6812	139.8096	151.1147 (64)
Heat gains from water heating, kWh/month	50.5226	44.2859	45.9373	40.3873	39.0037	34.0274	31.8984	36.0821	36.3584	41.9210	45.3232	49.0406 (65)
												1530.5007 (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	131.8963	131.8963	131.8963	131.8963	131.8963	131.8963	131.8963	131.8963	131.8963	131.8963	131.8963	131.8963 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	48.7516	43.3007	35.2145	26.6596	19.9284	16.8244	18.1794	23.6302	31.7164	40.2713	47.0025	50.1065 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	287.6743	290.6595	283.1370	267.1224	246.9070	227.9073	215.2143	212.2292	219.7517	235.7662	255.9817	274.9813 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.3879	50.3879	50.3879	50.3879	50.3879	50.3879	50.3879	50.3879	50.3879	50.3879	50.3879	50.3879 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-87.9308	-87.9308	-87.9308	-87.9308	-87.9308	-87.9308	-87.9308	-87.9308	-87.9308	-87.9308	-87.9308	-87.9308 (71)
Water heating gains (Table 5)	67.9068	65.9017	61.7437	56.0935	52.4243	47.2603	42.8741	48.4974	50.4978	56.3454	62.9488	65.9148 (72)
Total internal gains	501.6860	497.2152	477.4485	447.2289	416.6130	389.3453	373.6211	381.7101	399.3193	429.7362	463.2863	488.3560 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
North	3.3610	11.3201	0.7600	0.7200	0.7700	14.4278 (74)						
South	3.8160	49.0238	0.7600	0.7200	0.7700	70.9406 (78)						
Solar gains	85.3683	145.8898	198.4334	252.6476	271.2306	293.9481	271.9685	250.3278	222.4088	164.7888	114.6756	81.0670 (83)
Total gains	587.0543	643.1050	675.8819	699.8765	687.8437	683.2934	645.5897	632.0379	621.7280	594.5251	577.9620	569.4230 (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	40.5996	40.5996	40.7245	41.3175	41.4295	41.8536	41.9535	41.9535	41.7512	41.4295	41.3175	41.0869
alpha	3.7066	3.7066	3.7150	3.7545	3.7620	3.7902	3.7969	3.7969	3.7834	3.7620	3.7545	3.7391
util living area	0.9536	0.9351	0.8999	0.8329	0.7337	0.5519	0.4286	0.4461	0.6529	0.8425	0.9251	0.9577 (86)
MIT	19.7898	19.9536	20.2367	20.5536	20.7882	20.9475	20.9842	20.9815	20.8945	20.5930	20.1741	19.7685 (87)
Th 2	20.1005	20.1005	20.1030	20.1148	20.1170	20.1251	20.1270	20.1270	20.1232	20.1170	20.1148	20.1102 (88)
util rest of house	0.9458	0.9245	0.8832	0.8050	0.6886	0.4846	0.3481	0.3648	0.5906	0.8112	0.9112	0.9506 (89)
MIT 2	19.0115	19.1703	19.4455	19.7529	19.9637	20.0960	20.1208	20.1195	20.0576	19.7960	19.3986	18.9984 (90)
Living area fraction	19.1796	19.3395	19.6163	19.9258	20.1418	20.2799	20.3073	20.3057	20.2384	19.9681	19.5661	19.1647 (92)
Temperature adjustment	19.0296	19.1895	19.4663	19.7758	19.9918	20.1299	20.1573	20.1557	20.0884	19.8181	19.4161	-0.1500
adjusted MIT												19.0147 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9344	0.9117	0.8695	0.7930	0.6817	0.4850	0.3509	0.3676	0.5879	0.7992	0.8981	0.9398 (94)
Ext temp.	548.5642	586.3121	587.6529	555.0308	468.9084	331.4086	226.5602	232.3104	365.5443	475.1698	519.0417	535.1159 (95)
Heat loss rate W	4.3000	4.8000	6.6000	9.0000	11.8000	14.8000	16.6000	16.5000	14.0000	10.5000	7.1000	4.2000 (96)
Month fracti	981.9596	959.2866	855.1140	705.8959	535.1734	344.6750	229.4948	235.8432	394.6898	608.7556	806.7948	975.9242 (97)
Space heating kWh	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 per m2	322.4462	250.6389	198.9911	108.6229	49.3012	0.0000	0.0000	0.0000	0.0000	99.3878	207.1822	327.9614 (98)
												1564.5316 (98)
												22.9855 (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													1728.7642 (211)
Space heating requirement	322.4462	250.6389	198.9911	108.6229	49.3012	0.0000	0.0000	0.0000	0.0000	99.3878	207.1822	327.9614	(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)	356.2942	276.9490	219.8797	120.0253	54.4764	0.0000	0.0000	0.0000	0.0000	109.8208	228.9306	362.3883	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	155.5750	136.4610	141.7684	124.9493	120.8963	105.8049	99.5117	112.1040	112.8247	129.6812	139.8096	151.1147	(64)
Efficiency of water heater (217)m	89.4331	89.3455	89.1406	88.7595	88.2034	87.3000	87.3000	87.3000	87.3000	88.6602	89.1829	89.4656	(216)
Fuel for water heating, kWh/month	173.9569	152.7340	159.0390	140.7728	137.0653	121.1970	113.9881	128.4124	129.2379	146.2677	156.7674	168.9081	(219)
Water heating fuel used													1728.3466 (219)
Annual totals kWh/year													
Space heating fuel - main system													1728.7642 (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)													344.3872 (232)
Total delivered energy for all uses													3876.4981 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1728.7642	3.6300	62.7541 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1728.3466	3.6300	62.7390 (247)
Pumps and fans for heating	75.0000	19.4400	14.5800 (249)
Energy for lighting	344.3872	19.4400	66.9489 (250)
Additional standing charges			95.0000 (251)
Total energy cost			302.0220 (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	1728.7642	0.2160	373.4131 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1728.3466	0.2160	373.3229 (264)
Space and water heating			746.7359 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	344.3872	0.5190	178.7370 (268)
Total kg/year			964.3979 (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	1728.7642	1.2200	2109.0924 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1728.3466	1.2200	2108.5829 (264)
Space and water heating			4217.6753 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	344.3872	3.0700	1057.2688 (268)
Primary energy kWh/year			5505.1941 (272)
Primary energy kWh/m2/year			80.8802 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 84
 Current environmental impact rating: B 88

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	+ 1.3	-£ 24	-176 kg (18.2%)
U Solar photovoltaic panels	+ 11.8	-£ 369	-985 kg (124.9%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£24	2.59 kg/m ²	B 86 B 90
Solar photovoltaic panels	£369	14.46 kg/m ²	A 98 A 101
Total Savings	£393	17.05 kg/m²	

Potential energy efficiency rating: A 98
 Potential environmental impact rating: A 101

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

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

	Current	Potential	Saving
Electricity	£82	£91	-£10
Mains gas	£220	£187	£34
Space heating	£172	£172	£0
Water heating	£63	£39	£24
Lighting	£67	£67	£0
Generated (PV)	-£0	-£369	£369
Total cost of fuels	£302	-£91	£393
Total cost of uses	£302	-£91	£393
Delivered energy	57 kWh/m ²	16 kWh/m ²	41 kWh/m ²
Carbon dioxide emissions	1.0 tonnes	-0.2 tonnes	1.2 tonnes
CO2 emissions per m ²	14 kg/m ²	-3 kg/m ²	17 kg/m ²
Primary energy	81 kWh/m ²	-19 kWh/m ²	100 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	34.0330 (1b)	2.3260 (2b)	79.1608 (1b) - (3b)
First floor	34.0330 (1c)	2.5340 (2c)	86.2396 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.0660		
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 165.4004 (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) =	0.1814 (8)							
Pressure test					Yes							
Measured/design AP50					5.0100							
Infiltration rate					0.4319 (18)							
Number of sides sheltered					2 (19)							
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)							
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3671 (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	0.4680	0.4589	0.4497	0.4038	0.3946	0.3487	0.3487	0.3396	0.3671	0.3946	0.4130	0.4313 (22b)
	0.6095	0.6053	0.6011	0.5815	0.5779	0.5608	0.5608	0.5577	0.5674	0.5779	0.5853	0.5930 (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)			7.1800	1.2357	8.8726		(27)					
Solid Door			4.0600	1.2000	4.8720		(26)					
Flr - Ground			34.0330	0.1800	6.1259	75.6000	2572.8948 (28a)					
Wl - Brick	40.8230	11.2360	29.5870	0.2400	7.1009	38.9400	1152.1178 (29a)					
RF - Ins Joist	34.0330		34.0330	0.1000	3.4033	5.8200	198.0721 (30)					
Total net area of external elements Aum(A, m2)			108.8930				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.3747		(33)					
Party Wall			78.7620	0.0000	0.0000	54.0300	4255.5109 (32)					
Ground Floor Stud			49.7066			5.8200	289.2925 (32c)					
1st Floor Stud			79.9072			5.8200	465.0596 (32c)					
Internal Floor			34.0400			18.0000	612.7200 (32d)					
Internal Ceiling			34.0400			5.8200	198.1128 (32e)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	9743.7805 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							143.1519 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.3455 (36)					
Total fabric heat loss						(33) + (36) =	34.7202 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 33.2697	Feb 33.0375	Mar 32.8100	Apr 31.7411	May 31.5411	Jun 30.6102	Jul 30.6102	Aug 30.4378	Sep 30.9688	Oct 31.5411	Nov 31.9457	Dec 32.3686 (38)
Heat transfer coeff	67.9899	67.7577	67.5302	66.4613	66.2614	65.3304	65.3304	65.1580	65.6890	66.2614	66.6659	67.0888 (39)
Average = Sum(39)m / 12 =												66.4604 (39)
HLP	Jan 0.9989	Feb 0.9955	Mar 0.9921	Apr 0.9764	May 0.9735	Jun 0.9598	Jul 0.9598	Aug 0.9573	Sep 0.9651	Oct 0.9735	Nov 0.9794	Dec 0.9856 (40)
HLP (average)												0.9764 (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												2.1983 (42)
Average daily hot water use (litres/day)												86.4089 (43)
Daily hot water use	95.0498	91.5935	88.1371	84.6808	81.2244	77.7680	77.7680	81.2244	84.6808	88.1371	91.5935	95.0498 (44)
Energy conte	140.9561	123.2811	127.2151	110.9092	106.4200	91.8324	85.0962	97.6491	98.8154	115.1598	125.7059	136.5085 (45)
Energy content (annual)										Total = Sum(45)m =		1359.5490 (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	21.1434	18.4922	19.0823	16.6364	15.9630	13.7749	12.7644	14.6474	14.8223	17.2740	18.8559	20.4763 (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	14.6188	13.1798	14.5533	14.0401	14.4762	13.9725	14.4154	14.4549	14.0093	14.5214	14.1037	14.6062 (61)
Total heat required for water heating calculated for each month	155.5750	136.4610	141.7684	124.9493	120.8963	105.8049	99.5117	112.1040	112.8247	129.6812	139.8096	151.1147 (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												1.3340 (H8)
Utilisation factor												0.5275 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												86.4089 (H14)
Volume ratio Veff/V												0.8680 (H15)
Solar storage volume factor												0.9717 (H16)
Solar input												-817.3182 (H17)
Solar input	-23.7006	-39.5495	-67.3573	-90.2721	-111.5235	-109.6454	-108.1964		-94.5317	-74.0373	-50.5588	-28.1123
Solar input (sum of months) = Sum (63)m =												-817.3182 (63)
Output from w/h												
	131.8744	96.9115	74.4111	34.6772	9.3727	0.0000	0.0000		17.5723	38.7874	79.1225	111.6973
Total per year (kWh/year) = Sum (64)m =												725.7077 (64)
Heat gains from water heating, kWh/month												
	50.5226	44.2859	45.9373	40.3873	39.0037	34.0274	31.8984		36.0821	36.3584	41.9210	45.3232
												49.0406 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	131.8963	131.8963	131.8963	131.8963	131.8963	131.8963	131.8963	131.8963	131.8963	131.8963	131.8963	131.8963 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	48.7516	43.3007	35.2145	26.6596	19.9284	16.8244	18.1794		23.6302	31.7164	40.2713	47.0025
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	287.6743	290.6595	283.1370	267.1224	246.9070	227.9073	215.2143		212.2292	219.7517	235.7662	255.9817
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.3879	50.3879	50.3879	50.3879	50.3879	50.3879	50.3879		50.3879	50.3879	50.3879	50.3879
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000		3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-87.9308	-87.9308	-87.9308	-87.9308	-87.9308	-87.9308	-87.9308		-87.9308	-87.9308	-87.9308	-87.9308 (71)
Water heating gains (Table 5)	67.9068	65.9017	61.7437	56.0935	52.4243	47.2603	42.8741		48.4974	50.4978	56.3454	62.9488
Total internal gains	501.6860	497.2152	477.4485	447.2289	416.6130	389.3453	373.6211		381.7101	399.3193	429.7362	463.2863
												488.3560 (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	
North		3.3610	10.6334	0.7600	0.7200	0.7700	13.5525 (74)
South		3.8160	46.7521	0.7600	0.7200	0.7700	67.6532 (78)
Solar gains	81.2057	136.6981	185.1473	230.2070	261.4527	261.9130	251.4772
Total gains	582.8917	633.9133	662.5959	677.4359	678.0658	651.2583	625.0983
							609.0100
							599.6681
							580.0729
							560.1972
							69.7567 (83)
							558.1127 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, T _{hl} (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	39.8089	39.9453	40.0799	40.7245	40.8474	41.4295	41.4295		41.5391	41.2033	40.8474	40.5996
alpha	3.6539	3.6630	3.6720	3.7150	3.7232	3.7620	3.7620		3.7693	3.7469	3.7232	3.7066
util living area	0.9554	0.9377	0.9081	0.8497	0.7491	0.5926	0.4462		0.4743	0.6679	0.8503	0.9325
												0.9608 (86)
MIT	19.7422	19.9195	20.1777	20.4998	20.7628	20.9293	20.9812		20.9760	20.8842	20.5710	20.1160
Th 2	20.0843	20.0871	20.0899	20.1030	20.1055	20.1170	20.1170		20.1191	20.1125	20.1055	20.1005
util rest of house												
	0.9478	0.9273	0.8925	0.8234	0.7049	0.5250	0.3621		0.3904	0.6041	0.8194	0.9195
MIT 2	18.9522	19.1269	19.3789	19.6944	19.9324	20.0763	20.1095		20.1090	20.0407	19.7671	19.3318
Living area fraction												
MIT	19.1228	19.2980	19.5514	19.8683	20.1118	20.2605	20.2977		20.2963	20.2229	19.9407	19.5012
Temperature adjustment												
adjusted MIT	18.9728	19.1480	19.4014	19.7183	19.9618	20.1105	20.1477		20.1463	20.0729	19.7907	19.3512
												18.9486 (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	0.9364	0.9144	0.8786	0.8107	0.6971	0.5245	0.3651	0.3931	0.6010	0.8070	0.9065	0.9434	(94)	
Useful gains	545.8384	579.6564	582.1282	549.2055	472.6901	341.5997	228.2539	239.3772	360.4145	468.1269	507.8157	526.5397	(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														
997.6015	965.4153	871.2339	719.0011	547.4351	360.0049	231.7758	244.0988	392.3537	608.9888	816.7358	989.4644		(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														
336.1118	259.2300	215.0947	122.2528	55.6103	0.0000	0.0000	0.0000	0.0000	104.8013	222.4225	344.4160		(98)	
Space heating														
Space heating per m2													(98) / (4) =	24.3872 (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													1834.1870 (211)
Space heating requirement	336.1118	259.2300	215.0947	122.2528	55.6103	0.0000	0.0000	0.0000	0.0000	104.8013	222.4225	344.4160	(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)	371.3942	286.4419	237.6737	135.0860	61.4479	0.0000	0.0000	0.0000	0.0000	115.8025	245.7707	380.5701	(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	131.8744	96.9115	74.4111	34.6772	9.3727	0.0000	0.0000	17.5723	38.7874	79.1225	111.6973	131.2813	(64)
Efficiency of water heater (217)m	89.5748	89.6062	89.6553	89.7729	90.0241	87.3000	87.3000	87.3000	87.3000	89.0951	89.4044	87.3000	(216)
Fuel for water heating, kWh/month	147.2227	108.1526	82.9968	38.6277	10.4114	0.0000	0.0000	20.1286	44.4300	88.8068	124.9349	146.5297	(219)
Water heating fuel used													812.2412 (219)
Annual totals kWh/year													
Space heating fuel - main system													1834.1870 (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)													344.3872 (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													1388.5761 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1834.1870	3.4800	63.8297	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	812.2412	3.4800	28.2660	(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	344.3872	13.1900	45.4247	(250)
Additional standing charges			120.0000	(251)
Energy saving/generation technologies				
PV Unit		-1727.2394	13.1900	-227.8229 (252)
Total energy cost			46.1850	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)		0.1716 (257)
SAP value	$[(255) \times (256)] / [(4) + 45.0] =$	97.6067
SAP rating (Section 12)		98 (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	1834.1870	0.2160	396.1844 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	812.2412	0.2160	175.4441 (264)
Space and water heating			571.6285 (265)
Pumps and fans	125.0000	0.5190	64.8750 (267)
Energy for lighting	344.3872	0.5190	178.7370 (268)
Energy saving/generation technologies			
PV Unit			
Total kg/year	-1727.2394	0.5190	-896.4372 (269)
CO2 emissions per m2			-81.1968 (272)
EI value			-1.1900 (273)
EI rating			100.9623
EI band			101 (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 (m2)	Storey height (m)	Volume (m3)
Ground floor	34.0330 (1b)	x 2.3260 (2b)	= 79.1608 (1b) - (3b)
First floor	34.0330 (1c)	x 2.5340 (2c)	= 86.2396 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.0660		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 165.4004 (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) =	0.1814 (8)							
Pressure test				Yes								
Measured/design AP50					5.0100							
Infiltration rate					0.4319 (18)							
Number of sides sheltered					2 (19)							
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)							
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3671 (21)							
Wind speed	Jan 4.5000	Feb 4.5000	Mar 4.4000	Apr 3.9000	May 3.8000	Jun 3.4000	Jul 3.3000	Aug 3.3000	Sep 3.5000	Oct 3.8000	Nov 3.9000	Dec 4.1000 (22)
Wind factor	1.1250	1.1250	1.1000	0.9750	0.9500	0.8500	0.8250	0.8250	0.8750	0.9500	0.9750	1.0250 (22a)
Adj infilt rate	0.4130	0.4130	0.4038	0.3579	0.3487	0.3120	0.3029	0.3029	0.3212	0.3487	0.3579	0.3763 (22b)
Effective ac	0.5853	0.5853	0.5815	0.5641	0.5608	0.5487	0.5459	0.5459	0.5516	0.5608	0.5641	0.5708 (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)			7.1800	1.2357	8.8726		(27)					
Solid Door			4.0600	1.2000	4.8720		(26)					
Flr - Ground			34.0330	0.1800	6.1259	75.6000	2572.8948 (28a)					
Wl - Brick	40.8230	11.2360	29.5870	0.2400	7.1009	38.9400	1152.1178 (29a)					
RF - Ins Joist	34.0330		34.0330	0.1000	3.4033	5.8200	198.0721 (30)					
Total net area of external elements Aum(A, m2)			108.8930				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.3747		(33)					
Party Wall			78.7620	0.0000	0.0000	54.0300	4255.5109 (32)					
Ground Floor Stud			49.7066			5.8200	289.2925 (32c)					
1st Floor Stud			79.9072			5.8200	465.0596 (32c)					
Internal Floor			34.0400			18.0000	612.7200 (32d)					
Internal Ceiling			34.0400			5.8200	198.1128 (32e)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	9743.7805 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							143.1519 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.3455 (36)					
Total fabric heat loss						(33) + (36) =	34.7202 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 31.9457	Feb 31.9457	Mar 31.7411	Apr 30.7872	May 30.6102	Jun 29.9482	Jul 29.7942	Aug 29.7942	Sep 30.1068	Oct 30.6102	Nov 30.7872	Dec 31.1550 (38)
Heat transfer coeff	66.6659	66.6659	66.4613	65.5074	65.3304	64.6684	64.5144	64.5144	64.8270	65.3304	65.5074	65.8752 (39)
Average = Sum(39)m / 12 =												65.4890 (39)
HLP	Jan 0.9794	Feb 0.9794	Mar 0.9764	Apr 0.9624	May 0.9598	Jun 0.9501	Jul 0.9478	Aug 0.9478	Sep 0.9524	Oct 0.9598	Nov 0.9624	Dec 0.9678 (40)
HLP (average)												0.9621 (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												2.1983 (42)
Average daily hot water use (litres/day)												86.4089 (43)
Daily hot water use	95.0498	91.5935	88.1371	84.6808	81.2244	77.7680	77.7680	81.2244	84.6808	88.1371	91.5935	95.0498 (44)
Energy conte	140.9561	123.2811	127.2151	110.9092	106.4200	91.8324	85.0962	97.6491	98.8154	115.1598	125.7059	136.5085 (45)
Energy content (annual)										Total = Sum(45)m =		1359.5490 (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	21.1434	18.4922	19.0823	16.6364	15.9630	13.7749	12.7644	14.6474	14.8223	17.2740	18.8559	20.4763 (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	14.6188	13.1798	14.5533	14.0401	14.4762	13.9725	14.4154	14.4549	14.0093	14.5214	14.1037	14.6062 (61)
Total heat required for water heating calculated for each month	155.5750	136.4610	141.7684	124.9493	120.8963	105.8049	99.5117	112.1040	112.8247	129.6812	139.8096	151.1147 (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												1185.6484 (H5)
Overshading factor												0.8000 (H6)
Solar energy available												1991.8893 (H7)
Adjustment factor for showers												1.0000 (H7a)
Solar-to-load ratio												1.4651 (H8)
Utilisation factor												0.4947 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												86.4089 (H14)
Volume ratio Veff/V												0.8680 (H15)
Solar storage volume factor												0.9717 (H16)
Solar input												-841.8546 (H17)
Solar input	-23.6104	-40.0116	-68.3610	-93.5195	-108.8781	-115.6566	-110.0365	-98.1434	-77.7460	-52.5260	-31.5286	-21.8370 (63)
Solar input (sum of months) = Sum(63)m =												-841.8546 (63)
Output from w/h												
	131.9646	96.4494	73.4074	31.4298	12.0182	0.0000	0.0000	13.9606	35.0787	77.1552	108.2811	129.2777 (64)
Total per year (kWh/year) = Sum(64)m =												709.0226 (64)
Heat gains from water heating, kWh/month												
	50.5226	44.2859	45.9373	40.3873	39.0037	34.0274	31.8984	36.0821	36.3584	41.9210	45.3232	49.0406 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	131.8963	131.8963	131.8963	131.8963	131.8963	131.8963	131.8963	131.8963	131.8963	131.8963	131.8963	131.8963 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	48.7516	43.3007	35.2145	26.6596	19.9284	16.8244	18.1794	23.6302	31.7164	40.2713	47.0025	50.1065 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	287.6743	290.6595	283.1370	267.1224	246.9070	227.9073	215.2143	212.2292	219.7517	235.7662	255.9817	274.9813 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.3879	50.3879	50.3879	50.3879	50.3879	50.3879	50.3879	50.3879	50.3879	50.3879	50.3879	50.3879 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-87.9308	-87.9308	-87.9308	-87.9308	-87.9308	-87.9308	-87.9308	-87.9308	-87.9308	-87.9308	-87.9308	-87.9308 (71)
Water heating gains (Table 5)	67.9068	65.9017	61.7437	56.0935	52.4243	47.2603	42.8741	48.4974	50.4978	56.3454	62.9488	65.9148 (72)
Total internal gains	501.6860	497.2152	477.4485	447.2289	416.6130	389.3453	373.6211	381.7101	399.3193	429.7362	463.2863	488.3560 (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						
North		3.3610	11.3201	0.7600	0.7200	0.7700	14.4278 (74)					
South		3.8160	49.0238	0.7600	0.7200	0.7700	70.9406 (78)					
Solar gains	85.3683	145.8898	198.4334	252.6476	271.2306	293.9481	271.9685	250.3278	222.4088	164.7888	114.6756	81.0670 (83)
Total gains	587.0543	643.1050	675.8819	699.8765	687.8437	683.2934	645.5897	632.0379	621.7280	594.5251	577.9620	569.4230 (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	40.5996	40.5996	40.7245	41.3175	41.4295	41.8536	41.9535	41.9535	41.7512	41.4295	41.3175	41.0869
alpha	3.7066	3.7066	3.7150	3.7545	3.7620	3.7902	3.7969	3.7969	3.7834	3.7620	3.7545	3.7391
util living area	0.9536	0.9351	0.8999	0.8329	0.7337	0.5519	0.4286	0.4461	0.6529	0.8425	0.9251	0.9577 (86)
MIT	19.7898	19.9536	20.2367	20.5536	20.7882	20.9475	20.9842	20.9815	20.8945	20.5930	20.1741	19.7685 (87)
Th 2	20.1005	20.1005	20.1030	20.1148	20.1170	20.1251	20.1270	20.1270	20.1232	20.1170	20.1148	20.1102 (88)
util rest of house	0.9458	0.9245	0.8832	0.8050	0.6886	0.4846	0.3481	0.3648	0.5906	0.8112	0.9112	0.9506 (89)
MIT 2	19.0115	19.1703	19.4455	19.7529	19.9637	20.0960	20.1208	20.1195	20.0576	19.7960	19.3986	18.9984 (90)
Living area fraction									fLA = Living area / (4) =			0.2160 (91)
MIT	19.1796	19.3395	19.6163	19.9258	20.1418	20.2799	20.3073	20.3057	20.2384	19.9681	19.5661	19.1647 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.0296	19.1895	19.4663	19.7758	19.9918	20.1299	20.1573	20.1557	20.0884	19.8181	19.4161	19.0147 (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	0.9344	0.9117	0.8695	0.7930	0.6817	0.4850	0.3509	0.3676	0.5879	0.7992	0.8981	0.9398	(94)	
Useful gains	548.5642	586.3121	587.6529	555.0308	468.9084	331.4086	226.5602	232.3104	365.5443	475.1698	519.0417	535.1159	(95)	
Ext temp.	4.3000	4.8000	6.6000	9.0000	11.8000	14.8000	16.6000	16.5000	14.0000	10.5000	7.1000	4.2000	(96)	
Heat loss rate W														
981.9596	959.2866	855.1140	705.8959	535.1734	344.6750	229.4948	235.8432	394.6898	608.7556	806.7948	975.9242	975.9242	(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														
322.4462	250.6389	198.9911	108.6229	49.3012	0.0000	0.0000	0.0000	0.0000	99.3878	207.1822	327.9614	327.9614	(98)	
Space heating														
Space heating per m2													(98) / (4) = 22.9855	(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													1728.7642	(211)
Space heating requirement	322.4462	250.6389	198.9911	108.6229	49.3012	0.0000	0.0000	0.0000	0.0000	99.3878	207.1822	327.9614	327.9614	(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	90.5000	(210)
Space heating fuel (main heating system)	356.2942	276.9490	219.8797	120.0253	54.4764	0.0000	0.0000	0.0000	0.0000	109.8208	228.9306	362.3883	362.3883	(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	0.0000	(215)
Water heating requirement	131.9646	96.4494	73.4074	31.4298	12.0182	0.0000	0.0000	13.9606	35.0787	77.1552	108.2811	129.2777	129.2777	(64)
Efficiency of water heater (217)m	89.5468	89.5875	89.6148	89.7616	89.8545	87.3000	87.3000	87.3000	87.3000	89.0731	89.3755	89.5717	89.5717	(217)
Fuel for water heating, kWh/month	147.3694	107.6594	81.9144	35.0148	13.3751	0.0000	0.0000	15.9915	40.1818	86.6201	121.1530	144.3287	144.3287	(219)
Water heating fuel used													793.6083	(219)
Annual totals kWh/year														
Space heating fuel - main system													1728.7642	(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)													344.3872	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 2.50 * 1186 * 0.80) =													-1897.0374	(233)
Total delivered energy for all uses													1094.7224	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1728.7642	3.6300	62.7541	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	793.6083	3.6300	28.8080	(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	344.3872	19.4400	66.9489	(250)
Additional standing charges			95.0000	(251)
Energy saving/generation technologies				
PV Unit				
Total energy cost			-368.7841	(252)
			-90.9731	(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	1728.7642	0.2160	373.4131	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	793.6083	0.2160	171.4194	(264)
Space and water heating			544.8325	(265)
Pumps and fans	125.0000	0.5190	64.8750	(267)
Energy for lighting	344.3872	0.5190	178.7370	(268)
Energy saving/generation technologies				
PV Unit				
Total kg/year			-984.5624	(269)
			-196.1180	(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	1728.7642	1.2200	2109.0924 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	793.6083	1.2200	968.2021 (264)
Space and water heating			3077.2945 (265)
Pumps and fans	125.0000	3.0700	383.7500 (267)
Energy for lighting	344.3872	3.0700	1057.2688 (268)
Energy saving/generation technologies			
PV Unit	-1897.0374	3.0700	-5823.9049 (269)
Primary energy kWh/year			-1305.5916 (272)
Primary energy kWh/m2/year			-19.1813 (273)

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Designed)

Property Reference	139 - PRJ009077	Issued on Date	30/03/2022
Assessment Reference	139 M	Prop Type Ref	BLO-0328
Property	Plot 139		
SAP Rating	84 B	DER	16.26
		TER	17.80
Environmental	88 B	% DER<TER	8.68
CO₂ Emissions (t/year)	0.96	DFEE	34.64
		TFEE	42.97
General Requirements Compliance	Pass	% DFEE<TFEE	19.38
Assessor Details	Chris Nicholls, , Tel: ,	Assessor ID	W947-0001
Client			

SUMMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	17.80	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	16.26	kgCO ₂ /m ²	Pass
	-1.54 (-8.7%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	42.97	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	34.64	kWh/m ² /yr	
	-8.4 (-19.5%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.18 (max. 0.25)	0.18 (max. 0.70)	Pass
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	Pass
Openings	1.26 (max. 2.00)	1.30 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	5.01 (design value)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system	Boiler system with radiators or underfloor - Mains gas Data from database Ideal LOGIC COMBI ESP1 30 Combi boiler Efficiency: 89.6% SEDBUK2009 Minimum: 88.0%	Pass
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BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Designed)

Secondary heating system

None

5 Cylinder insulation

Hot water storage

No cylinder

6 Controls

Space heating controls

Programmer, room thermostat and TRVs

Pass

Hot water controls

No cylinder

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100

%

Minimum

75

%

Pass

8 Mechanical ventilation

Not applicable

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Midlands)

Not significant

Pass

Based on:

Overshading

Average

Windows facing North

3.36 m², No overhang

Windows facing South

3.82 m², No overhang

Air change rate

4.21 ach

Blinds/curtains

Dark-coloured curtain or roller blind, closed 100% of daylight hours

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

5.01 (design value)

Maximum

10.0

Pass

10 Key features

Party wall U-value

0.00

W/m²K

Roof U-value

0.10

W/m²K