

PREDICTED ENERGY ASSESSMENT



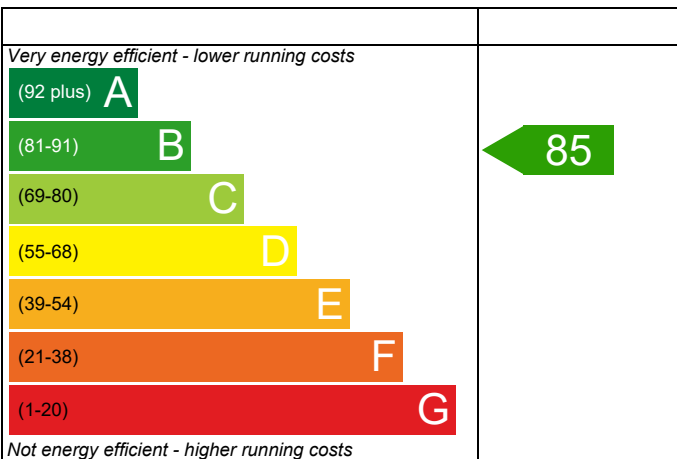
Plot 41

Dwelling type: House, Mid-Terrace
 Date of assessment: 18/08/2022
 Produced by: Michael Juckes
 Total floor area: 94.14 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.

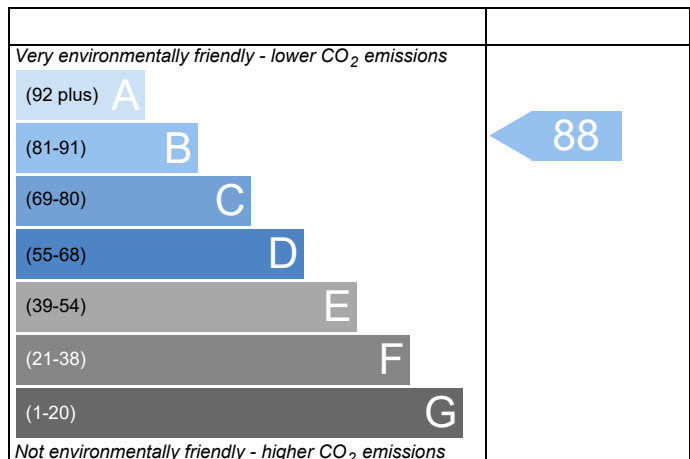
Energy Efficiency Rating



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.

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Designed)



Property Reference	041 - PRJ012620	Issued on Date	18/08/2022
Assessment Reference	041 M	Prop Type Ref	Clover
Property	Plot 41		

SAP Rating	85 B	DER	15.36	TER	16.33
Environmental	88 B	% DER<TER	5.96		
CO ₂ Emissions (t/year)	1.20	DFEE	38.35	TFEE	44.43
General Requirements Compliance	Pass	% DFEE<TFEE	13.68		

Assessor Details	Mr. Michael Juckes, Michael Juckes, Tel: 02033971373, michael@briaryenergy.co.uk	Assessor ID	T850-0001
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)	16.33	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	15.36	kgCO ₂ /m ²	Pass
	-0.97 (-5.9%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	44.43	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	38.35	kWh/m ² /yr	
	-6.0 (-13.5%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.25 (max. 0.30)	0.25 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.13 (max. 0.25)	0.13 (max. 0.70)	Pass
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	Pass
Openings	1.37 (max. 2.00)	1.40 (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)	m ³ /(h.m ²) @ 50 Pa	
Maximum	10.0	m ³ /(h.m ²) @ 50 Pa	Pass

Limiting System Efficiencies

4 Heating efficiency

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Designed)



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

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 (South East England)

Slight

Pass

Based on:

Overshading

Average

Windows facing East

5.99 m², No overhang

Windows facing West

5.94 m², No overhang

Air change rate

3.87 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) m³/(h.m²) @ 50 Pa

Maximum

10.0 m³/(h.m²) @ 50 Pa

Pass

10 Key features

Party wall U-value

0.00

W/m²K

Roof U-value

0.10

W/m²K

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	041 - PRJ012620	Issued on Date	18/08/2022
Assessment Reference	041 M	Prop Type Ref	Clover
Property	Plot 41		

SAP Rating	85 B	DER	15.36	TER	16.33
Environmental	88 B	% DER<TER	5.96		
CO ₂ Emissions (t/year)	1.20	DFEE	38.35	TTEE	44.43
General Requirements Compliance	Pass	% DFEE<TTEE	13.68		

Assessor Details	Mr. Michael Juckes, Michael Juckes, Tel: 02033971373, michael@briaryenergy.co.uk	Assessor ID	T850-0001
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Client	
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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	47.0700 (1b)	x 2.3900 (2b)	= 112.4973 (1b) - (3b)
First floor	47.0700 (1c)	x 2.6900 (2c)	= 126.6183 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.1400		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 239.1156 (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) =	0.1255 (8)							
Pressure test				Yes								
Measured/design AP50					5.0100							
Infiltration rate					0.3760 (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) =		0.3196 (21)							
Wind speed	Jan 4.8000	Feb 4.5000	Mar 4.4000	Apr 3.9000	May 3.9000	Jun 3.6000	Jul 3.7000	Aug 3.5000	Sep 3.7000	Oct 4.0000	Nov 4.1000	Dec 4.4000 (22)
Wind factor	1.2000	1.1250	1.1000	0.9750	0.9750	0.9000	0.9250	0.8750	0.9250	1.0000	1.0250	1.1000 (22a)
Adj infiltr rate	0.3835	0.3595	0.3515	0.3116	0.3116	0.2876	0.2956	0.2796	0.2956	0.3196	0.3276	0.3515 (22b)
Effective ac	0.5735	0.5646	0.5618	0.5485	0.5485	0.5414	0.5437	0.5391	0.5437	0.5511	0.5536	0.5618 (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 = 1.40)			11.9300	1.3258	15.8163		(27)
Solid Door			1.9500	1.2000	2.3400		(26)
Flr - Ground			47.0720	0.1300	6.1194	75.6000	3558.6432 (28a)
Wl - Brick	2.5550		2.5550	0.2500	0.6388	51.1800	130.7649 (29a)
Wl - Render	52.9540	13.8800	39.0740	0.2500	9.7685	51.1800	1999.8073 (29a)
Rf - Ins Joist	47.0720		47.0720	0.1000	4.7072	5.8200	273.9590 (30)
Total net area of external elements Aum(A, m ²)			149.6530				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.3901		(33)
Party Wall			87.1940	0.0000	0.0000	54.0300	4711.0918 (32)
Ground Floor Stud			82.7595			5.8200	481.6603 (32c)
1st Floor Stud			100.8056			5.8200	586.6888 (32c)
Internal Floor			47.0700			18.0000	847.2600 (32d)
Internal Ceiling			47.0700			5.8200	273.9474 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	12863.8228 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							136.6457 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.1451 (36)
Total fabric heat loss						(33) + (36) =	49.5352 (37)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF HEAT DEMAND 09 Jan 2014

Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)m \times (5)$

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	45.2561	44.5535	44.3294	43.2843	43.2843	42.7177	42.9016	42.5389	42.9016	43.4833	43.6872	44.3294 (38)
Heat transfer coeff	94.7913	94.0888	93.8646	92.8196	92.8196	92.2530	92.4368	92.0742	92.4368	93.0185	93.2225	93.8646 (39)
Average = Sum(39)m / 12 =												93.1408 (39)
HLP	1.0069	0.9995	0.9971	0.9860	0.9860	0.9800	0.9819	0.9781	0.9819	0.9881	0.9903	0.9971 (40)
HLP (average)												0.9894 (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 2.6783 (42)
Average daily hot water use (litres/day) 97.8086 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	107.5894	103.6771	99.7648	95.8524	91.9401	88.0277	88.0277	91.9401	95.8524	99.7648	103.6771	107.5894 (44)
Energy conte	159.5520	139.5452	143.9982	125.5411	120.4597	103.9475	96.3227	110.5317	111.8518	130.3525	142.2899	154.5176 (45)
Energy content (annual)										Total = Sum(45)m =		1538.9098 (45)
Distribution loss (46)m = $0.15 \times (45)m$	23.9328	20.9318	21.5997	18.8312	18.0690	15.5921	14.4484	16.5798	16.7778	19.5529	21.3435	23.1776 (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	14.6956	13.2597	14.6479	14.1193	14.5492	14.0328	14.4713	14.5218	14.0799	14.6070	14.1852	14.6805 (61)
Total heat required for water heating calculated for each month	174.2476	152.8049	158.6461	139.6604	135.0088	117.9803	110.7940	125.0535	125.9317	144.9595	156.4751	169.1981 (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)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h	174.2476	152.8049	158.6461	139.6604	135.0088	117.9803	110.7940	125.0535	125.9317	144.9595	156.4751	169.1981 (64)
Total per year (kWh/year) = Sum(64)m =												1710.7600 (64)
RHI water heating demand												1711 (64)
Heat gains from water heating, kWh/month	56.7249	49.7137	51.5414	45.2722	43.6901	38.0708	35.6451	40.3822	40.7107	46.9940	50.8577	55.0472 (65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabolic gains (Table 5), Watts	160.6954	160.6954	160.6954	160.6954	160.6954	160.6954	160.6954	160.6954	160.6954	160.6954	160.6954	160.6954 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	60.2487	53.5124	43.5192	32.9468	24.6281	20.7921	22.4666	29.2030	39.1962	49.7685	58.0872	61.9232 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	367.8979	371.7155	362.0952	341.6147	315.7618	291.4637	275.2311	271.4134	281.0337	301.5142	327.3672	351.6653 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.7478	53.7478	53.7478	53.7478	53.7478	53.7478	53.7478	53.7478	53.7478	53.7478	53.7478	53.7478 (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)	-107.1302	-107.1302	-107.1302	-107.1302	-107.1302	-107.1302	-107.1302	-107.1302	-107.1302	-107.1302	-107.1302	-107.1302 (71)
Water heating gains (Table 5)	76.2432	73.9787	69.2760	62.8781	58.7233	52.8761	47.9101	54.2772	56.5426	63.1639	70.6357	73.9882 (72)
Total internal gains	614.7027	609.5196	585.2034	547.7526	509.4262	475.4448	455.9207	465.2065	487.0854	524.7596	566.4030	597.8896 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
East	5.9910	23.7288	0.5000	0.0000	0.7700	54.7313 (76)						
West	5.9360	23.7288	0.5000	0.0000	0.7700	54.2289 (80)						
Solar gains	108.9602	189.4214	309.9615	474.2749	556.9895	608.6565	573.0558	498.2369	385.2730	240.1730	137.1839	86.6500 (83)
Total gains	723.6629	798.9410	895.1649	1022.0275	1066.4156	1084.1013	1028.9765	963.4434	872.3584	764.9326	703.5869	684.5396 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	37.6963	37.9778	38.0685	38.4971	38.4971	38.7335	38.6565	38.8088	38.6565	38.4148	38.3307	38.0685
alpha	3.5131	3.5319	3.5379	3.5665	3.5665	3.5822	3.5771	3.5873	3.5771	3.5610	3.5554	3.5379
util living area	0.9597	0.9432	0.8989	0.7977	0.6465	0.4584	0.3195	0.3301	0.5834	0.8261	0.9324	0.9640 (86)
MIT	19.6674	19.8398	20.1872	20.5887	20.8529	20.9679	20.9935	20.9931	20.9253	20.6199	20.1098	19.6619 (87)
Th 2	20.0776	20.0838	20.0858	20.0950	20.0950	20.1001	20.0984	20.1017	20.0984	20.0933	20.0915	20.0858 (88)
util rest of house	0.9526	0.9335	0.8818	0.7657	0.5947	0.3908	0.2413	0.2474	0.5110	0.7887	0.9187	0.9575 (89)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF HEAT DEMAND 09 Jan 2014

MIT 2	18.8784	19.0510	19.3874	19.7675	19.9948	20.0839	20.0965	20.0997	20.0569	19.8040	19.3234	18.8799 (90)
Living area fraction									fLA = Living area / (4) =			0.2014 (91)
MIT	19.0373	19.2099	19.5485	19.9329	20.1676	20.2619	20.2771	20.2796	20.2318	19.9683	19.4818	19.0374 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.8873	19.0599	19.3985	19.7829	20.0176	20.1119	20.1271	20.1296	20.0818	19.8183	19.3318	18.8874 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9410	0.9202	0.8666	0.7536	0.5900	0.3917	0.2438	0.2500	0.5096	0.7757	0.9046	0.9466 (94)
Useful gains	680.9718	735.1528	775.7676	770.1566	629.2157	424.6762	250.8440	240.8367	444.5809	593.3586	636.4562	647.9603 (95)
Ext temp.	5.0000	5.4000	7.1000	9.5000	12.6000	15.4000	17.4000	17.5000	15.0000	11.7000	8.1000	5.2000 (96)
Heat loss rate W												
1316.3955	1285.2418	1154.3954	954.4536	688.5016	434.6880	252.0889	242.1175	469.7421	755.1566	1047.0573	1284.7603 (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												
472.7552	369.6599	281.6991	132.6939	44.1088	0.0000	0.0000	0.0000	0.0000	120.3777	295.6328	473.7792 (98)	
Space heating												2190.7064 (98)
RHI space heating demand												2191 (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	47.0700 (1b)	x 2.3900 (2b)	= 112.4973 (1b) - (3b)
First floor	47.0700 (1c)	x 2.6900 (2c)	= 126.6183 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.1400		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 239.1156 (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) = 0.1255 (8)
Pressure test					Yes
Measured/design AP50					5.0100
Infiltration rate					0.3760 (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) =	0.3196 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4074	0.3995	0.3915	0.3515	0.3435	0.3036	0.3036	0.2956	0.3196	0.3435	0.3595	0.3755 (22b)
Effective ac	0.5830	0.5798	0.5766	0.5618	0.5590	0.5461	0.5461	0.5437	0.5511	0.5590	0.5646	0.5705 (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 = 1.40)			11.9300	1.3258	15.8163		(27)
Solid Door			1.9500	1.2000	2.3400		(26)
Flr - Ground			47.0720	0.1300	6.1194	75.6000	3558.6432 (28a)
Wl - Brick	2.5550		2.5550	0.2500	0.6388	51.1800	130.7649 (29a)
Wl - Render	52.9540	13.8800	39.0740	0.2500	9.7685	51.1800	1999.8073 (29a)
Rf - Ins Joist	47.0720		47.0720	0.1000	4.7072	5.8200	273.9590 (30)
Total net area of external elements Aum(A, m2)			149.6530				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.3901		(33)
Party Wall			87.1940	0.0000	0.0000	54.0300	4711.0918 (32)
Ground Floor Stud			82.7595			5.8200	481.6603 (32c)
1st Floor Stud			100.8056			5.8200	586.6888 (32c)
Internal Floor			47.0700			18.0000	847.2600 (32d)
Internal Ceiling			47.0700			5.8200	273.9474 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	12863.8228 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							136.6457 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.1451 (36)
Total fabric heat loss						(33) + (36) =	49.5352 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	46.0040	45.7497	45.5004	44.3294	44.1103	43.0904	43.0904	42.9016	43.4833	44.1103	44.5535	45.0169 (38)
Average = Sum(39)m / 12 =	95.5393	95.2849	95.0356	93.8646	93.6455	92.6257	92.6257	92.4368	93.0185	93.6455	94.0888	94.5521 (39)
HLP	1.0149	1.0122	1.0095	0.9971	0.9947	0.9839	0.9839	0.9819	0.9881	0.9947	0.9995	1.0044 (40)
HLP (average)												0.9971 (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												2.6783 (42)
Average daily hot water use (litres/day)												97.8086 (43)
Daily hot water use	107.5894	103.6771	99.7648	95.8524	91.9401	88.0277	88.0277	91.9401	95.8524	99.7648	103.6771	107.5894 (44)
Energy conte	159.5520	139.5452	143.9982	125.5411	120.4597	103.9475	96.3227	110.5317	111.8518	130.3525	142.2899	154.5176 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

Energy content (annual)												Total = Sum(45)m =	1538.9098 (45)
Distribution loss (46)m = 0.15 x (45)m													
	23.9328	20.9318	21.5997	18.8312	18.0690	15.5921	14.4484	16.5798	16.7778	19.5529	21.3435	23.1776	(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	14.6956	13.2597	14.6479	14.1193	14.5492	14.0328	14.4713	14.5218	14.0799	14.6070	14.1852	14.6805	(61)
Total heat required for water heating calculated for each month	174.2476	152.8049	158.6461	139.6604	135.0088	117.9803	110.7940	125.0535	125.9317	144.9595	156.4751	169.1981	(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)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)	
Output from w/h	174.2476	152.8049	158.6461	139.6604	135.0088	117.9803	110.7940	125.0535	125.9317	144.9595	156.4751	169.1981	(64)
Total per year (kWh/year) = Sum(64)m =												1710.7600 (64)	
Heat gains from water heating, kWh/month	56.7249	49.7137	51.5414	45.2722	43.6901	38.0708	35.6451	40.3822	40.7107	46.9940	50.8577	55.0472	(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	160.6954	160.6954	160.6954	160.6954	160.6954	160.6954	160.6954	160.6954	160.6954	160.6954	160.6954	160.6954	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	60.2487	53.5124	43.5192	32.9468	24.6281	20.7921	22.4666	29.2030	39.1962	49.7685	58.0872	61.9232	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	367.8979	371.7155	362.0952	341.6147	315.7618	291.4637	275.2311	271.4134	281.0337	301.5142	327.3672	351.6653	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.7478	53.7478	53.7478	53.7478	53.7478	53.7478	53.7478	53.7478	53.7478	53.7478	53.7478	53.7478	(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)	-107.1302	-107.1302	-107.1302	-107.1302	-107.1302	-107.1302	-107.1302	-107.1302	-107.1302	-107.1302	-107.1302	-107.1302	(71)
Water heating gains (Table 5)	76.2432	73.9787	69.2760	62.8781	58.7233	52.8761	47.9101	54.2772	56.5426	63.1639	70.6357	73.9882	(72)
Total internal gains	614.7027	609.5196	585.2034	547.7526	509.4262	475.4448	455.9207	465.2065	487.0854	524.7596	566.4030	597.8896	(73)

6. Solar gains

[Jan]		Area m2	Solar flux Table 6a W/m2	Specific data g or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W						
East		5.9910	19.6403	0.5000	0.0000	0.7700	45.3010	(76)					
West		5.9360	19.6403	0.5000	0.0000	0.7700	44.8851	(80)					
Solar gains	90.1860	176.4230	290.5436	423.7405	519.3098	531.6060	506.1106	434.7415	337.9142	209.3408	112.4514	74.1646	(83)
Total gains	704.8888	785.9426	875.7469	971.4931	1028.7360	1007.0508	962.0313	899.9480	824.9996	734.1003	678.8543	672.0542	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	37.4012	37.5010	37.5994	38.0685	38.1575	38.5777	38.5777	38.6565	38.4148	38.1575	37.9778	37.7917	
alpha	3.4934	3.5001	3.5066	3.5379	3.5438	3.5718	3.5718	3.5771	3.5610	3.5438	3.5319	3.5194	
util living area	0.9670	0.9506	0.9146	0.8361	0.7110	0.5486	0.4120	0.4549	0.6744	0.8750	0.9500	0.9715	(86)
MIT	19.5222	19.7265	20.0654	20.4742	20.7731	20.9342	20.9818	20.9741	20.8607	20.4606	19.9231	19.4824	(87)
Th 2	20.0710	20.0732	20.0754	20.0858	20.0877	20.0968	20.0968	20.0984	20.0933	20.0877	20.0838	20.0797	(88)
util rest of house	0.9613	0.9422	0.9000	0.8089	0.6653	0.4827	0.3321	0.3724	0.6106	0.8477	0.9400	0.9665	(89)
MIT 2	18.7302	18.9319	19.2624	19.6564	19.9233	20.0592	20.0895	20.0875	20.0056	19.6547	19.1360	18.6978	(90)
Living area fraction												fLA = Living area / (4) = 0.2014 (91)	
MIT	18.8897	19.0919	19.4241	19.8211	20.0945	20.2354	20.2692	20.2660	20.1778	19.8170	19.2945	18.8558	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.7397	18.9419	19.2741	19.6711	19.9445	20.0854	20.1192	20.1160	20.0278	19.6670	19.1445	18.7058	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9508	0.9295	0.8850	0.7949	0.6576	0.4818	0.3341	0.3741	0.6056	0.8329	0.9272	0.9569	(94)
Useful gains	670.1740	730.5133	774.9957	772.2517	676.4520	485.2228	321.4240	336.6397	499.6029	611.3961	629.4586	643.0635	(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	1379.5582	1337.9834	1213.9966	1011.0243	772.0582	508.0881	325.9716	343.4973	551.3989	849.0813	1133.2516	1371.5567	(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	527.7819	408.2199	326.6167	171.9163	71.1310	0.0000	0.0000	0.0000	0.0000	176.8378	362.7310	541.9989	(98)
Space heating												2587.2334 (98)	
Space heating per m2												(98) / (4) = 27.4828 (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

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													2858.8215 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	527.7819	408.2199	326.6167	171.9163	71.1310	0.0000	0.0000	0.0000	0.0000	176.8378	362.7310	541.9989	(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)	583.1844	451.0717	360.9024	189.9627	78.5978	0.0000	0.0000	0.0000	0.0000	195.4009	400.8077	598.8938	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	174.2476	152.8049	158.6461	139.6604	135.0088	117.9803	110.7940	125.0535	125.9317	144.9595	156.4751	169.1981	(64)
Efficiency of water heater (217)m	89.6841	89.6054	89.4283	89.0371	88.3783	87.3000	87.3000	87.3000	87.3000	89.0299	89.5112	87.3000	(216)
Fuel for water heating, kWh/month	194.2905	170.5309	177.4002	156.8564	152.7624	135.1436	126.9117	143.2457	144.2517	162.8211	174.8107	188.5896	(219)
Water heating fuel used													1927.6145 (219)
Annual totals kWh/year													
Space heating fuel - main system													2858.8215 (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)													425.6046 (232)
Total delivered energy for all uses													5287.0406 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2858.8215	3.4800	99.4870 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1927.6145	3.4800	67.0810 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	425.6046	13.1900	56.1372 (250)
Additional standing charges			120.0000 (251)
Total energy cost			352.5977 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.0643 (257)
SAP value		85.1526
SAP rating (Section 12)		85 (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	2858.8215	0.2160	617.5054 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1927.6145	0.2160	416.3647 (264)
Space and water heating			1033.8702 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	425.6046	0.5190	220.8888 (268)
Total kg/year			1293.6840 (272)
CO2 emissions per m2			13.7400 (273)
EI value			87.5411
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	$3.48 / 0.8863 = 3.926$, stars = 4
Water heating environmental impact	$0.216 / 0.8863 = 0.2437$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

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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	47.0700 (1b)	2.3900 (2b)	112.4973 (1b) - (3b)
First floor	47.0700 (1c)	2.6900 (2c)	126.6183 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.1400		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 239.1156 (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) =	0.1255 (8)
Pressure test					Yes
Measured/design AP50					5.0100
Infiltration rate					0.3760 (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) =	0.3196 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.8000	4.5000	4.4000	3.9000	3.9000	3.6000	3.7000	3.5000	3.7000	4.0000	4.1000	4.4000 (22)
Wind factor	1.2000	1.1250	1.1000	0.9750	0.9750	0.9000	0.9250	0.8750	0.9250	1.0000	1.0250	1.1000 (22a)
Adj inflt rate												
Effective ac	0.3835	0.3595	0.3515	0.3116	0.3116	0.2876	0.2956	0.2796	0.2956	0.3196	0.3276	0.3515 (22b)
	0.5735	0.5646	0.5618	0.5485	0.5485	0.5414	0.5437	0.5391	0.5437	0.5511	0.5536	0.5618 (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 = 1.40)			11.9300	1.3258	15.8163		(27)
Solid Door			1.9500	1.2000	2.3400		(26)
Flr - Ground			47.0720	0.1300	6.1194	75.6000	3558.6432 (28a)
Wl - Brick	2.5550		2.5550	0.2500	0.6388	51.1800	130.7649 (29a)
Wl - Render	52.9540	13.8800	39.0740	0.2500	9.7685	51.1800	1999.8073 (29a)
Rf - Ins Joist	47.0720		47.0720	0.1000	4.7072	5.8200	273.9590 (30)
Total net area of external elements Aum(A, m2)			149.6530				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 39.3901		(33)
Party Wall			87.1940	0.0000	0.0000	54.0300	4711.0918 (32)
Ground Floor Stud			82.7595			5.8200	481.6603 (32c)
1st Floor Stud			100.8056			5.8200	586.6888 (32c)
Internal Floor			47.0700			18.0000	847.2600 (32d)
Internal Ceiling			47.0700			5.8200	273.9474 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 12863.8228 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							136.6457 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.1451 (36)
Total fabric heat loss							(33) + (36) = 49.5352 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	45.2561	44.5535	44.3294	43.2843	43.2843	42.7177	42.9016	42.5389	42.9016	43.4833	43.6872	44.3294 (38)
Average = Sum(39)m / 12 =	94.7913	94.0888	93.8646	92.8196	92.8196	92.2530	92.4368	92.0742	92.4368	93.0185	93.2225	93.8646 (39)
												93.1408 (39)
HLP	1.0069	0.9995	0.9971	0.9860	0.9860	0.9800	0.9819	0.9781	0.9819	0.9881	0.9903	0.9971 (40)
HLP (average)												0.9894 (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												2.6783 (42)
Average daily hot water use (litres/day)												97.8086 (43)
Daily hot water use	107.5894	103.6771	99.7648	95.8524	91.9401	88.0277	88.0277	91.9401	95.8524	99.7648	103.6771	107.5894 (44)
Energy conte	159.5520	139.5452	143.9982	125.5411	120.4597	103.9475	96.3227	110.5317	111.8518	130.3525	142.2899	154.5176 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

Energy content (annual)												Total = Sum(45)m =	1538.9098 (45)
Distribution loss (46)m = 0.15 x (45)m													
	23.9328	20.9318	21.5997	18.8312	18.0690	15.5921	14.4484	16.5798	16.7778	19.5529	21.3435	23.1776	(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	14.6956	13.2597	14.6479	14.1193	14.5492	14.0328	14.4713	14.5218	14.0799	14.6070	14.1852	14.6805	(61)
Total heat required for water heating calculated for each month	174.2476	152.8049	158.6461	139.6604	135.0088	117.9803	110.7940	125.0535	125.9317	144.9595	156.4751	169.1981	(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)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)	
Output from w/h	174.2476	152.8049	158.6461	139.6604	135.0088	117.9803	110.7940	125.0535	125.9317	144.9595	156.4751	169.1981	(64)
Total per year (kWh/year) = Sum(64)m =												1710.7600 (64)	
Heat gains from water heating, kWh/month	56.7249	49.7137	51.5414	45.2722	43.6901	38.0708	35.6451	40.3822	40.7107	46.9940	50.8577	55.0472	(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	160.6954	160.6954	160.6954	160.6954	160.6954	160.6954	160.6954	160.6954	160.6954	160.6954	160.6954	160.6954	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	60.2487	53.5124	43.5192	32.9468	24.6281	20.7921	22.4666	29.2030	39.1962	49.7685	58.0872	61.9232	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	367.8979	371.7155	362.0952	341.6147	315.7618	291.4637	275.2311	271.4134	281.0337	301.5142	327.3672	351.6653	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.7478	53.7478	53.7478	53.7478	53.7478	53.7478	53.7478	53.7478	53.7478	53.7478	53.7478	53.7478	(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)	-107.1302	-107.1302	-107.1302	-107.1302	-107.1302	-107.1302	-107.1302	-107.1302	-107.1302	-107.1302	-107.1302	-107.1302	(71)
Water heating gains (Table 5)	76.2432	73.9787	69.2760	62.8781	58.7233	52.8761	47.9101	54.2772	56.5426	63.1639	70.6357	73.9882	(72)
Total internal gains	614.7027	609.5196	585.2034	547.7526	509.4262	475.4448	455.9207	465.2065	487.0854	524.7596	566.4030	597.8896	(73)

6. Solar gains

[Jan]		Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d	Gains W				
East		5.9910	23.7288	0.5000	0.0000	0.0000	0.7700	54.7313 (76)					
West		5.9360	23.7288	0.5000	0.0000	0.0000	0.7700	54.2289 (80)					
Solar gains	108.9602	189.4214	309.9615	474.2749	556.9895	608.6565	573.0558	498.2369	385.2730	240.1730	137.1839	86.6500	(83)
Total gains	723.6629	798.9410	895.1649	1022.0275	1066.4156	1084.1013	1028.9765	963.4434	872.3584	764.9326	703.5869	684.5396	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	37.6963	37.9778	38.0685	38.4971	38.4971	38.7335	38.6565	38.8088	38.6565	38.4148	38.3307	38.0685	
alpha	3.5131	3.5319	3.5379	3.5665	3.5665	3.5822	3.5771	3.5873	3.5771	3.5610	3.5554	3.5379	
util living area	0.9597	0.9432	0.8989	0.7977	0.6465	0.4584	0.3195	0.3301	0.5834	0.8261	0.9324	0.9640	(86)
MIT	19.6674	19.8398	20.1872	20.5887	20.8529	20.9679	20.9935	20.9931	20.9253	20.6199	20.1098	19.6619	(87)
Th 2	20.0776	20.0838	20.0858	20.0950	20.0950	20.1001	20.0984	20.1017	20.0984	20.0933	20.0915	20.0858	(88)
util rest of house	0.9526	0.9335	0.8818	0.7657	0.5947	0.3908	0.2413	0.2474	0.5110	0.7887	0.9187	0.9575	(89)
MIT 2	18.8784	19.0510	19.3874	19.7675	19.9948	20.0839	20.0965	20.0997	20.0569	19.8040	19.3234	18.8799	(90)
Living area fraction												fLA = Living area / (4) = 0.2014 (91)	
MIT	19.0373	19.2099	19.5485	19.9329	20.1676	20.2619	20.2771	20.2796	20.2318	19.9683	19.4818	19.0374	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.8873	19.0599	19.3985	19.7829	20.0176	20.1119	20.1271	20.1296	20.0818	19.8183	19.3318	18.8874	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9410	0.9202	0.8666	0.7536	0.5900	0.3917	0.2438	0.2500	0.5096	0.7757	0.9046	0.9466	(94)
Useful gains	680.9718	735.1528	775.7676	770.1566	629.2157	424.6762	250.8440	240.8367	444.5809	593.3586	636.4562	647.9603	(95)
Ext temp.	5.0000	5.4000	7.1000	9.5000	12.6000	15.4000	17.4000	17.5000	15.0000	11.7000	8.1000	5.2000	(96)
Heat loss rate W	1316.3955	1285.2418	1154.3954	954.4536	688.5016	434.6880	252.0889	242.1175	469.7421	755.1566	1047.0573	1284.7603	(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	472.7552	369.6599	281.6991	132.6939	44.1088	0.0000	0.0000	0.0000	0.0000	120.3777	295.6328	473.7792	(98)
Space heating												2190.7064 (98)	
Space heating per m ²												(98) / (4) = 23.2707 (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

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													2420.6701 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	472.7552	369.6599	281.6991	132.6939	44.1088	0.0000	0.0000	0.0000	0.0000	120.3777	295.6328	473.7792	(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)	522.3814	408.4639	311.2697	146.6231	48.7390	0.0000	0.0000	0.0000	0.0000	133.0140	326.6661	523.5129	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	174.2476	152.8049	158.6461	139.6604	135.0088	117.9803	110.7940	125.0535	125.9317	144.9595	156.4751	169.1981	(64)
Efficiency of water heater (217)m	89.6153	89.5401	89.3204	88.8303	88.0668	87.3000	87.3000	87.3000	87.3000	88.7233	89.3663	87.3000	(216)
Fuel for water heating, kWh/month	194.4395	170.6553	177.6145	157.2216	153.3027	135.1436	126.9117	143.2457	144.2517	163.3839	175.0941	188.7626	(219)
Water heating fuel used													1930.0268 (219)
Annual totals kWh/year													
Space heating fuel - main system													2420.6701 (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)													425.6046 (232)
Total delivered energy for all uses													4851.3015 (238)

10a. Fuel costs - using BEDF prices (500)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2420.6701	3.6300	87.8703 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1930.0268	3.6300	70.0600 (247)
Pumps and fans for heating	75.0000	19.4400	14.5800 (249)
Energy for lighting	425.6046	19.4400	82.7375 (250)
Additional standing charges			95.0000 (251)
Total energy cost			350.2478 (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	2420.6701	0.2160	522.8647 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1930.0268	0.2160	416.8858 (264)
Space and water heating			939.7505 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	425.6046	0.5190	220.8888 (268)
Total kg/year			1199.5643 (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	2420.6701	1.2200	2953.2175 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1930.0268	1.2200	2354.6327 (264)
Space and water heating			5307.8502 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	425.6046	3.0700	1306.6062 (268)
Primary energy kWh/year			6844.7064 (272)
Primary energy kWh/m2/year			72.7077 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 85
 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	+ 1.2	-£ 27	-191 kg (15.9%)
U Solar photovoltaic panels	+ 9.6	-£ 375	-1000 kg (99.2%)

Recommended measures	Typical annual savings		Energy efficiency	Environmental impact
Solar water heating	£27	2.03 kg/m ²	B 86	B 89
Solar photovoltaic panels	£375	10.63 kg/m ²	A 96	A 98
Total Savings	£401	12.66 kg/m²		

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

Fuel prices for cost data on this page from database revision number 500 TEST (30 Jun 2022)
 Recommendation texts revision number 4.9c (22 Feb 2014)

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

	Current	Potential	Saving
Electricity	£97	£107	-£10
Mains gas	£253	£216	£36
Space heating	£197	£197	£0
Water heating	£70	£43	£27
Lighting	£83	£83	£0
Generated (PV)	-£0	-£375	£375
Total cost of fuels	£350	-£52	£401
Total cost of uses	£350	-£52	£401
Delivered energy	52 kWh/m ²	21 kWh/m ²	31 kWh/m ²
Carbon dioxide emissions	1.2 tonnes	0.0 tonnes	1.2 tonnes
CO2 emissions per m ²	13 kg/m ²	0 kg/m ²	13 kg/m ²
Primary energy	73 kWh/m ²	-2 kWh/m ²	74 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	47.0700 (1b)	2.3900 (2b)	112.4973 (1b) - (3b)
First floor	47.0700 (1c)	2.6900 (2c)	126.6183 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.1400		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 239.1156 (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) =	0.1255 (8)							
Pressure test					Yes							
Measured/design AP50					5.0100							
Infiltration rate					0.3760 (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) =	0.3196 (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	0.4074	0.3995	0.3915	0.3515	0.3435	0.3036	0.3036	0.2956	0.3196	0.3435	0.3595	0.3755 (22b)
Effective ac	0.5830	0.5798	0.5766	0.5618	0.5590	0.5461	0.5461	0.5437	0.5511	0.5590	0.5646	0.5705 (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 = 1.40)			11.9300	1.3258	15.8163		(27)
Solid Door			1.9500	1.2000	2.3400		(26)
Flr - Ground			47.0720	0.1300	6.1194	75.6000	3558.6432 (28a)
Wl - Brick	2.5550		2.5550	0.2500	0.6388	51.1800	130.7649 (29a)
Wl - Render	52.9540	13.8800	39.0740	0.2500	9.7685	51.1800	1999.8073 (29a)
Rf - Ins Joist	47.0720		47.0720	0.1000	4.7072	5.8200	273.9590 (30)
Total net area of external elements Aum(A, m2)			149.6530				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 39.3901		(33)
Party Wall			87.1940	0.0000	0.0000	54.0300	4711.0918 (32)
Ground Floor Stud			82.7595			5.8200	481.6603 (32c)
1st Floor Stud			100.8056			5.8200	586.6888 (32c)
Internal Floor			47.0700			18.0000	847.2600 (32d)
Internal Ceiling			47.0700			5.8200	273.9474 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 12863.8228 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							136.6457 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.1451 (36)
Total fabric heat loss							(33) + (36) = 49.5352 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	46.0040	45.7497	45.5004	44.3294	44.1103	43.0904	43.0904	42.9016	43.4833	44.1103	44.5535	45.0169 (38)
Average = Sum(39)m / 12 =	95.5393	95.2849	95.0356	93.8646	93.6455	92.6257	92.6257	92.4368	93.0185	93.6455	94.0888	94.5521 (39)
HLP	1.0149	1.0122	1.0095	0.9971	0.9947	0.9839	0.9839	0.9819	0.9881	0.9947	0.9995	1.0044 (40)
HLP (average)												0.9971 (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												2.6783 (42)
Average daily hot water use (litres/day)												97.8086 (43)
Daily hot water use	107.5894	103.6771	99.7648	95.8524	91.9401	88.0277	88.0277	91.9401	95.8524	99.7648	103.6771	107.5894 (44)
Energy conte	159.5520	139.5452	143.9982	125.5411	120.4597	103.9475	96.3227	110.5317	111.8518	130.3525	142.2899	154.5176 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Energy content (annual)												Total = Sum(45)m =	1538.9098 (45)
Distribution loss (46)m = 0.15 x (45)m													
	23.9328	20.9318	21.5997	18.8312	18.0690	15.5921	14.4484	16.5798	16.7778	19.5529	21.3435	23.1776	(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	14.6956	13.2597	14.6479	14.1193	14.5492	14.0328	14.4713	14.5218	14.0799	14.6070	14.1852	14.6805	(61)
Total heat required for water heating calculated for each month	174.2476	152.8049	158.6461	139.6604	135.0088	117.9803	110.7940	125.0535	125.9317	144.9595	156.4751	169.1981	(62)
Aperture area of solar collector													
Zero-loss collector efficiency													
Collector heat loss coefficient													
Collector 2nd order heat loss coefficient													
Collector effective heat loss coefficient													
Collector performance ratio													
Annual solar radiation per m2													
Overshading factor													
Solar energy available													
Adjustment factor for showers													
Solar-to-load ratio													
Utilisation factor													
Collector performance factor													
Dedicated solar storage volume													
Effective solar volume													
Daily hot water demand													
Volume ratio Veff/V													
Solar storage volume factor													
Solar input	-25.0444	-41.7920	-71.1765	-95.3905	-117.8470	-115.8623	-114.3312	-99.8917	-78.2352	-53.4255	-29.7063	-20.9579	(63)
Solar input (sum of months) = Sum(63)m =													
Output from w/h	149.2032	111.0130	87.4696	44.2699	17.1619	2.1180	0.0000	25.1617	47.6965	91.5340	126.7688	148.2402	(64)
Total per year (kWh/year) = Sum(64)m =													
Heat gains from water heating, kWh/month	56.7249	49.7137	51.5414	45.2722	43.6901	38.0708	35.6451	40.3822	40.7107	46.9940	50.8577	55.0472	(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	160.6954	160.6954	160.6954	160.6954	160.6954	160.6954	160.6954	160.6954	160.6954	160.6954	160.6954	160.6954	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	60.2487	53.5124	43.5192	32.9468	24.6281	20.7921	22.4666	29.2030	39.1962	49.7685	58.0872	61.9232	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	367.8979	371.7155	362.0952	341.6147	315.7618	291.4637	275.2311	271.4134	281.0337	301.5142	327.3672	351.6653	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.7478	53.7478	53.7478	53.7478	53.7478	53.7478	53.7478	53.7478	53.7478	53.7478	53.7478	53.7478	(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)	-107.1302	-107.1302	-107.1302	-107.1302	-107.1302	-107.1302	-107.1302	-107.1302	-107.1302	-107.1302	-107.1302	-107.1302	(71)
Water heating gains (Table 5)	76.2432	73.9787	69.2760	62.8781	58.7233	52.8761	47.9101	54.2772	56.5426	63.1639	70.6357	73.9882	(72)
Total internal gains	614.7027	609.5196	585.2034	547.7526	509.4262	475.4448	455.9207	465.2065	487.0854	524.7596	566.4030	597.8896	(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							
East	5.9910	19.6403	0.5000	0.0000	0.7700	45.3010 (76)							
West	5.9360	19.6403	0.5000	0.0000	0.7700	44.8851 (80)							
Solar gains	90.1860	176.4230	290.5436	423.7405	519.3098	531.6060	506.1106	434.7415	337.9142	209.3408	112.4514	74.1646	(83)
Total gains	704.8888	785.9426	875.7469	971.4931	1028.7360	1007.0508	962.0313	899.9480	824.9996	734.1003	678.8543	672.0542	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	37.4012	37.5010	37.5994	38.0685	38.1575	38.5777	38.5777	38.6565	38.4148	38.1575	37.9778	37.7917	
alpha	3.4934	3.5001	3.5066	3.5379	3.5438	3.5718	3.5718	3.5771	3.5610	3.5438	3.5319	3.5194	
util living area	0.9670	0.9506	0.9146	0.8361	0.7110	0.5486	0.4120	0.4549	0.6744	0.8750	0.9500	0.9715	(86)
MIT	19.5222	19.7265	20.0654	20.4742	20.7731	20.9342	20.9818	20.9741	20.8607	20.4606	19.9231	19.4824	(87)
Th 2	20.0710	20.0732	20.0754	20.0858	20.0877	20.0968	20.0968	20.0984	20.0933	20.0877	20.0838	20.0797	(88)
util rest of house	0.9613	0.9422	0.9000	0.8089	0.6653	0.4827	0.3321	0.3724	0.6106	0.8477	0.9400	0.9665	(89)
MIT 2	18.7302	18.9319	19.2624	19.6564	19.9233	20.0592	20.0895	20.0875	20.0056	19.6547	19.1360	18.6978	(90)
Living area fraction													
MIT	18.8897	19.0919	19.4241	19.8211	20.0945	20.2354	20.2692	20.2660	20.1778	19.8170	19.2945	18.8558	(91)
Temperature adjustment													
adjusted MIT	18.7397	18.9419	19.2741	19.6711	19.9445	20.0854	20.1192	20.1160	20.0278	19.6670	19.1445	18.7058	(92)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9508	0.9295	0.8850	0.7949	0.6576	0.4818	0.3341	0.3741	0.6056	0.8329	0.9272	0.9569	(94)
Useful gains	670.1740	730.5133	774.9957	772.2517	676.4520	485.2228	321.4240	336.6397	499.6029	611.3961	629.4586	643.0635	(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													
	1379.5582	1337.9834	1213.9966	1011.0243	772.0582	508.0881	325.9716	343.4973	551.3989	849.0813	1133.2516	1371.5567	(97)
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													
	527.7819	408.2199	326.6167	171.9163	71.1310	0.0000	0.0000	0.0000	0.0000	176.8378	362.7310	541.9989	(98)
Space heating												2587.2334	(98)
Space heating per m2												(98) / (4) =	27.4828 (99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2858.8215 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	527.7819	408.2199	326.6167	171.9163	71.1310	0.0000	0.0000	0.0000	0.0000	176.8378	362.7310	541.9989	(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)	583.1844	451.0717	360.9024	189.9627	78.5978	0.0000	0.0000	0.0000	0.0000	195.4009	400.8077	598.8938	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	149.2032	111.0130	87.4696	44.2699	17.1619	2.1180	0.0000	25.1617	47.6965	91.5340	126.7688	148.2402	(64)
Efficiency of water heater													87.3000 (216)
(217)m	89.7747	89.7963	89.8047	89.8258	89.8598	87.3000	87.3000	87.3000	87.3000	89.3825	89.6490	89.7931	(217)
Fuel for water heating, kWh/month	166.1972	123.6276	97.3998	49.2842	19.0985	2.4261	0.0000	28.8222	54.6351	102.4071	141.4057	165.0908	(219)
												950.3944	(219)
Water heating fuel used													
Annual totals kWh/year													
Space heating fuel - main system													2858.8215 (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)													425.6046 (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													2632.5811 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2858.8215	3.4800	99.4870	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	950.3944	3.4800	33.0737	(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	425.6046	13.1900	56.1372	(250)
Additional standing charges			120.0000	(251)
Energy saving/generation technologies				
PV Unit		-1727.2394	13.1900	-227.8229 (252)
Total energy cost			97.3626	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.2939 (257)
SAP value		95.9002
SAP rating (Section 12)		96 (258)
SAP band		A

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

Energy Emission factor Emissions

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

	kWh/year	kg CO2/kWh	kg CO2/year
Space heating - main system 1	2858.8215	0.2160	617.5054 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	950.3944	0.2160	205.2852 (264)
Space and water heating			822.7906 (265)
Pumps and fans	125.0000	0.5190	64.8750 (267)
Energy for lighting	425.6046	0.5190	220.8888 (268)
Energy saving/generation technologies			
PV Unit	-1727.2394	0.5190	-896.4372 (269)
Total kg/year			212.1172 (272)
CO2 emissions per m2			2.2500 (273)
EI value			97.9572
EI rating			98 (274)
EI band			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	47.0700 (1b)	x 2.3900 (2b)	= 112.4973 (1b) - (3b)
First floor	47.0700 (1c)	x 2.6900 (2c)	= 126.6183 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.1400		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 239.1156 (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) = 0.1255 (8)
Pressure test					Yes
Measured/design AP50					5.0100
Infiltration rate					0.3760 (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) =	0.3196 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.8000	4.5000	4.4000	3.9000	3.9000	3.6000	3.7000	3.5000	3.7000	4.0000	4.1000	4.4000 (22)
Wind factor	1.2000	1.1250	1.1000	0.9750	0.9750	0.9000	0.9250	0.8750	0.9250	1.0000	1.0250	1.1000 (22a)
Adj infilt rate	0.3835	0.3595	0.3515	0.3116	0.3116	0.2876	0.2956	0.2796	0.2956	0.3196	0.3276	0.3515 (22b)
Effective ac	0.5735	0.5646	0.5618	0.5485	0.5485	0.5414	0.5437	0.5391	0.5437	0.5511	0.5536	0.5618 (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 = 1.40)			11.9300	1.3258	15.8163		(27)
Solid Door			1.9500	1.2000	2.3400		(26)
Flr - Ground			47.0720	0.1300	6.1194	75.6000	3558.6432 (28a)
Wl - Brick	2.5550		2.5550	0.2500	0.6388	51.1800	130.7649 (29a)
Wl - Render	52.9540	13.8800	39.0740	0.2500	9.7685	51.1800	1999.8073 (29a)
Rf - Ins Joist	47.0720		47.0720	0.1000	4.7072	5.8200	273.9590 (30)
Total net area of external elements Aum(A, m2)			149.6530				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 39.3901		(33)
Party Wall			87.1940	0.0000	0.0000	54.0300	4711.0918 (32)
Ground Floor Stud			82.7595			5.8200	481.6603 (32c)
1st Floor Stud			100.8056			5.8200	586.6888 (32c)
Internal Floor			47.0700			18.0000	847.2600 (32d)
Internal Ceiling			47.0700			5.8200	273.9474 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 12863.8228 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							136.6457 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.1451 (36)
Total fabric heat loss							(33) + (36) = 49.5352 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	45.2561	44.5535	44.3294	43.2843	43.2843	42.7177	42.9016	42.5389	42.9016	43.4833	43.6872	44.3294 (38)
Average = Sum(39)m / 12 =	94.7913	94.0888	93.8646	92.8196	92.8196	92.2530	92.4368	92.0742	92.4368	93.0185	93.2225	93.8646 (39)
HLP	1.0069	0.9995	0.9971	0.9860	0.9860	0.9800	0.9819	0.9781	0.9819	0.9881	0.9903	0.9971 (40)
HLP (average)												0.9894 (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												2.6783 (42)
Average daily hot water use (litres/day)												97.8086 (43)
Daily hot water use	107.5894	103.6771	99.7648	95.8524	91.9401	88.0277	88.0277	91.9401	95.8524	99.7648	103.6771	107.5894 (44)
Energy conte	159.5520	139.5452	143.9982	125.5411	120.4597	103.9475	96.3227	110.5317	111.8518	130.3525	142.2899	154.5176 (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

Energy content (annual)												Total = Sum(45)m =	1538.9098 (45)
Distribution loss (46)m = 0.15 x (45)m													
	23.9328	20.9318	21.5997	18.8312	18.0690	15.5921	14.4484	16.5798	16.7778	19.5529	21.3435	23.1776	(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	14.6956	13.2597	14.6479	14.1193	14.5492	14.0328	14.4713	14.5218	14.0799	14.6070	14.1852	14.6805	(61)
Total heat required for water heating calculated for each month	174.2476	152.8049	158.6461	139.6604	135.0088	117.9803	110.7940	125.0535	125.9317	144.9595	156.4751	169.1981	(62)
Aperture area of solar collector													
Zero-loss collector efficiency													
Collector heat loss coefficient													
Collector 2nd order heat loss coefficient													
Collector effective heat loss coefficient													
Collector performance ratio													
Annual solar radiation per m2													
Overshading factor													
Solar energy available													
Adjustment factor for showers													
Solar-to-load ratio													
Utilisation factor													
Collector performance factor													
Dedicated solar storage volume													
Effective solar volume													
Daily hot water demand													
Volume ratio Veff/V													
Solar storage volume factor													
Solar input	-27.6705	-41.1031	-69.8119	-98.6192	-117.1418	-123.1027	-120.0657	-105.9061	-82.1621	-56.2149	-33.1541	-22.3851	(63)
Solar input (sum of months) = Sum(63)m =													
Output from w/h	146.5771	111.7019	88.8341	41.0412	17.8670	0.0000	0.0000	19.1474	43.7697	88.7446	123.3210	146.8130	(64)
Total per year (kWh/year) = Sum(64)m =													
Heat gains from water heating, kWh/month	56.7249	49.7137	51.5414	45.2722	43.6901	38.0708	35.6451	40.3822	40.7107	46.9940	50.8577	55.0472	(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	160.6954	160.6954	160.6954	160.6954	160.6954	160.6954	160.6954	160.6954	160.6954	160.6954	160.6954	160.6954	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	60.2487	53.5124	43.5192	32.9468	24.6281	20.7921	22.4666	29.2030	39.1962	49.7685	58.0872	61.9232	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	367.8979	371.7155	362.0952	341.6147	315.7618	291.4637	275.2311	271.4134	281.0337	301.5142	327.3672	351.6653	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.7478	53.7478	53.7478	53.7478	53.7478	53.7478	53.7478	53.7478	53.7478	53.7478	53.7478	53.7478	(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)	-107.1302	-107.1302	-107.1302	-107.1302	-107.1302	-107.1302	-107.1302	-107.1302	-107.1302	-107.1302	-107.1302	-107.1302	(71)
Water heating gains (Table 5)	76.2432	73.9787	69.2760	62.8781	58.7233	52.8761	47.9101	54.2772	56.5426	63.1639	70.6357	73.9882	(72)
Total internal gains	614.7027	609.5196	585.2034	547.7526	509.4262	475.4448	455.9207	465.2065	487.0854	524.7596	566.4030	597.8896	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W							
East	5.9910	23.7288	0.5000	0.0000	0.7700	54.7313 (76)							
West	5.9360	23.7288	0.5000	0.0000	0.7700	54.2289 (80)							
Solar gains	108.9602	189.4214	309.9615	474.2749	556.9895	608.6565	573.0558	498.2369	385.2730	240.1730	137.1839	86.6500	(83)
Total gains	723.6629	798.9410	895.1649	1022.0275	1066.4156	1084.1013	1028.9765	963.4434	872.3584	764.9326	703.5869	684.5396	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	37.6963	37.9778	38.0685	38.4971	38.4971	38.7335	38.6565	38.8088	38.6565	38.4148	38.3307	38.0685	
alpha	3.5131	3.5319	3.5379	3.5665	3.5665	3.5822	3.5771	3.5873	3.5771	3.5610	3.5554	3.5379	
util living area	0.9597	0.9432	0.8989	0.7977	0.6465	0.4584	0.3195	0.3301	0.5834	0.8261	0.9324	0.9640	(86)
MIT	19.6674	19.8398	20.1872	20.5887	20.8529	20.9679	20.9935	20.9931	20.9253	20.6199	20.1098	19.6619	(87)
Th 2	20.0776	20.0838	20.0858	20.0950	20.0950	20.1001	20.0984	20.1017	20.0984	20.0933	20.0915	20.0858	(88)
util rest of house	0.9526	0.9335	0.8818	0.7657	0.5947	0.3908	0.2413	0.2474	0.5110	0.7887	0.9187	0.9575	(89)
MIT 2	18.8784	19.0510	19.3874	19.7675	19.9948	20.0839	20.0965	20.0997	20.0569	19.8040	19.3234	18.8799	(90)
Living area fraction													
MIT	19.0373	19.2099	19.5485	19.9329	20.1676	20.2619	20.2771	20.2796	20.2318	19.9683	19.4818	19.0374	(92)
Temperature adjustment													
adjusted MIT	18.8873	19.0599	19.3985	19.7829	20.0176	20.1119	20.1271	20.1296	20.0818	19.8183	19.3318	18.8874	(93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9410	0.9202	0.8666	0.7536	0.5900	0.3917	0.2438	0.2500	0.5096	0.7757	0.9046	0.9466	(94)
Useful gains	680.9718	735.1528	775.7676	770.1566	629.2157	424.6762	250.8440	240.8367	444.5809	593.3586	636.4562	647.9603	(95)
Ext temp.	5.0000	5.4000	7.1000	9.5000	12.6000	15.4000	17.4000	17.5000	15.0000	11.7000	8.1000	5.2000	(96)
Heat loss rate W													
	1316.3955	1285.2418	1154.3954	954.4536	688.5016	434.6880	252.0889	242.1175	469.7421	755.1566	1047.0573	1284.7603	(97)
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													
	472.7552	369.6599	281.6991	132.6939	44.1088	0.0000	0.0000	0.0000	0.0000	120.3777	295.6328	473.7792	(98)
Space heating													
Space heating per m2													(98) / (4) = 23.2707 (99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2420.6701 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	472.7552	369.6599	281.6991	132.6939	44.1088	0.0000	0.0000	0.0000	0.0000	120.3777	295.6328	473.7792	(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)	522.3814	408.4639	311.2697	146.6231	48.7390	0.0000	0.0000	0.0000	0.0000	133.0140	326.6661	523.5129	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	146.5771	111.7019	88.8341	41.0412	17.8670	0.0000	0.0000	19.1474	43.7697	88.7446	123.3210	146.8130	(64)
Efficiency of water heater	89.7216	89.7367	89.7116	89.7231	89.5537	87.3000	87.3000	87.3000	87.3000	89.1138	89.5340	89.7220	(217)
(217)m	89.7216	89.7367	89.7116	89.7231	89.5537	87.3000	87.3000	87.3000	87.3000	89.1138	89.5340	89.7220	(217)
Fuel for water heating, kWh/month	163.3687	124.4774	99.0219	45.7420	19.9512	0.0000	0.0000	21.9329	50.1371	99.5857	137.7366	163.6310	(219)
Water heating fuel used													
Annual totals kWh/year													925.5843 (219)
Space heating fuel - main system													2420.6701 (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)													425.6046 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 2.50 * 1205 * 0.80) =										-1927.6103			-1927.6103 (233)
Total delivered energy for all uses													1969.2487 (238)

10a. Fuel costs - using BEDF prices (500)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2420.6701	3.6300	87.8703	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	925.5843	3.6300	33.5987	(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	425.6046	19.4400	82.7375	(250)
Additional standing charges			95.0000	(251)
Energy saving/generation technologies				
PV Unit	-1927.6103	19.4400	-374.7274	(252)
Total energy cost			-51.2209	(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	2420.6701	0.2160	522.8647	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	925.5843	0.2160	199.9262	(264)
Space and water heating			722.7909	(265)
Pumps and fans	125.0000	0.5190	64.8750	(267)
Energy for lighting	425.6046	0.5190	220.8888	(268)
Energy saving/generation technologies				
PV Unit	-1927.6103	0.5190	-1000.4297	(269)
Total kg/year			8.1250	(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	2420.6701	1.2200	2953.2175	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	925.5843	1.2200	1129.2128	(264)
Space and water heating			4082.4303	(265)
Pumps and fans	125.0000	3.0700	383.7500	(267)
Energy for lighting	425.6046	3.0700	1306.6062	(268)
Energy saving/generation technologies				
PV Unit	-1927.6103	3.0700	-5917.7636	(269)
Primary energy kWh/year			-144.9770	(272)
Primary energy kWh/m2/year			-1.5400	(273)

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Designed)



Property Reference	041 - PRJ012620	Issued on Date	18/08/2022
Assessment Reference	041 M	Prop Type Ref	Clover
Property	Plot 41		

SAP Rating	85 B	DER	15.36	TER	16.33
Environmental	88 B	% DER<TER	5.96		
CO₂ Emissions (t/year)	1.20	DFEE	38.35	TFEE	44.43
General Requirements Compliance	Pass	% DFEE<TFEE	13.68		

Assessor Details	Mr. Michael Juckes, Michael Juckes, Tel: 02033971373, michael@briaryenergy.co.uk	Assessor ID	T850-0001
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Client	
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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)	16.33	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	15.36	kgCO ₂ /m ²	Pass
	-0.97 (-5.9%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	44.43	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	38.35	kWh/m ² /yr	
	-6.0 (-13.5%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.25 (max. 0.30)	0.25 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.13 (max. 0.25)	0.13 (max. 0.70)	Pass
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	Pass
Openings	1.37 (max. 2.00)	1.40 (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

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Designed)



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

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 (South East England)

Slight

Pass

Based on:

Overshading

Average

Windows facing East

5.99 m², No overhang

Windows facing West

5.94 m², No overhang

Air change rate

3.87 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