

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

Property Reference	089 - PRJ013014			Issued on Date	03/06/2025
Assessment Reference	089	Prop Type Ref	D-SP		
Property	4 Moorman Road, Netley Abbey, SOUTHAMPTON, SO31 5JU				
SAP Rating	85 B	DER	14.87	TER	17.84
Environmental	87 B	% DER<TER	16.63		
CO ₂ Emissions (t/year)	1.19	DFEE	48.90	TFEE	54.80
General Requirements Compliance	Pass	% DFEE<TFEE	10.77		
Assessor Details	Mr. Christopher Nicholls, Briary Energy Limited, Tel: 0203 397 1373, chris@briaryenergy.co.uk			Assessor ID	U903-0001
Client					

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

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DWELLING AS BUILT

Semi-Detached House, total floor area 96 m²

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

1a TER and DER

Fuel for main heating:Mains gas

Fuel factor:1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 17.84 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 14.87 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 54.8 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE) 48.9 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.21 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.18 (max. 0.25)	0.18 (max. 0.70)	OK
Roof	0.08 (max. 0.20)	0.17 (max. 0.35)	OK
Openings	1.38 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.82 (measured in this dwelling)
Maximum 10.0 OK

4 Heating efficiency

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

Data from database

Vaillant ecoFIT sustain 835 VUW 356/6-3 (H-GB)

Combi boiler

Efficiency: 89.3% SEDBUK2009

Minimum: 88.0% OK

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls:

No cylinder

Boiler interlock

Yes

OK

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Southern England): Slight OK

Based on:

Overshading:

Average

Windows facing North East: 8.37 m², No overhang

Windows facing South East: 6.05 m², No overhang

Windows facing South West: 0.81 m², No overhang

Windows facing North West: 6.16 m², No overhang

Air change rate: 4.68 ach

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

10 Key features

Party wall U-value 0.00 W/m²K

Roof U-value 0.08 W/m²K

Air permeability 3.8 m³/m²h

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	48.5500 (1b)	x 2.3600 (2b)	= 114.5780 (1b) - (3b)
First floor	47.3200 (1c)	x 2.6300 (2c)	= 124.4516 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	95.8700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 239.0296 (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					4 * 10 = 40.0000 (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)					40.0000 / (5) = 0.1673 (8)
Pressure test					Yes
Measured/design AP50					3.8200
Infiltration rate					0.3583 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3315 (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	0.4226	0.4143	0.4060	0.3646	0.3563	0.3149	0.3149	0.3066	0.3315	0.3563	0.3729	0.3895 (22b)
Effective ac	0.5893	0.5858	0.5824	0.5665	0.5635	0.5496	0.5496	0.5470	0.5549	0.5635	0.5695	0.5758 (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
Solid Door			2.0400	1.2000	2.4480		(26)
Windows (Uw = 1.40)			21.4000	1.3258	28.3580		(27)
Flr - Ground			48.5530	0.1800	8.7395	75.6000	3670.6068 (28a)
Wl - Brick (Timber Frame)	61.8070	17.9090	43.8980	0.2100	9.2186	7.4000	324.8452 (29a)
Wl - Clad (Timber Frame)	38.8060	5.5240	33.2820	0.2100	6.9892	7.4000	246.2868 (29a)
Rf - Ins Joist	47.3200		47.3200	0.0800	3.7856	7.4000	350.1680 (30)
Rf - Flat over Bay	1.2300		1.2300	0.1700	0.2091	9.0000	11.0700 (30)
Total net area of external elements Aum(A, m ²)			197.7130				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	59.7480		(33)
Party Wall			43.9660	0.0000	0.0000	7.4000	325.3484 (32)
Stud			76.2760			7.4000	564.4425 (32c)
Internal Floor			47.3200			7.4000	350.1680 (32d)
Internal Ceiling			47.3200			7.4000	350.1680 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 6193.1037 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							64.5990 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							20.9223 (36)
Total fabric heat loss							(33) + (36) = 80.6703 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	46.4842	46.2106	45.9425	44.6832	44.4475	43.3507	43.3507	43.1476	43.7732	44.4475	44.9242	45.4225 (38)
Heat transfer coeff	127.1545	126.8809	126.6128	125.3535	125.1178	124.0210	124.0210	123.8178	124.4435	125.1178	125.5945	126.0928 (39)
Average = Sum(39)m / 12 =												125.3523 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3263	1.3235	1.3207	1.3075	1.3051	1.2936	1.2936	1.2915	1.2980	1.3051	1.3101	1.3152 (40)
HLP (average)												1.3075 (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												2.6979 (42)
Average daily hot water use (litres/day)												98.2742 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	108.1017	104.1707	100.2397	96.3088	92.3778	88.4468	88.4468	92.3778	96.3088	100.2397	104.1707	108.1017 (44)
Energy conte	160.3117	140.2096	144.6837	126.1388	121.0332	104.4424	96.7813	111.0579	112.3843	130.9731	142.9673	155.2533 (45)

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Energy content (annual)	Total = Sum (45)m = 1546.2366 (45)										
Distribution loss (46)m = 0.15 x (45)m											
24.0467	21.0314	21.7026	18.9208	18.1550	15.6664	14.5172	16.6587	16.8576	19.6460	21.4451	23.2880 (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	0.6707	0.6087	0.6508	0.5467	0.5031	0.4157	0.3852	0.4617	0.5892	0.6206	0.6496 (61)
Total heat required for water heating calculated for each month											
160.9824	140.8183	145.3346	126.6855	121.5363	104.8581	97.1665	111.5196	112.8714	131.5622	143.5880	155.9028 (62)
WWHRS	-52.8897	-46.5364	-47.4963	-39.0773	-36.2834	-29.9315	-25.3312	-30.6705	-31.5656	-39.0222	-45.2032 eq. (G10)
Total of WWHRS savings											
Solar input	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											
108.0926	94.2819	97.8383	87.6082	85.2529	74.9266	71.8353	80.8491	81.3057	92.5400	98.3847	104.7822 (64)
Heat gains from water heating, kWh/month											
53.4713	46.7719	48.2701	42.0778	40.3693	34.8310	32.2761	37.0422	37.4895	43.6958	47.6918	51.7841 (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	134.8932	134.8932	134.8932	134.8932	134.8932	134.8932	134.8932	134.8932	134.8932	134.8932	134.8932	134.8932 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.2407	19.7540	16.0650	12.1623	9.0914	7.6754	8.2935	10.7802	14.4692	18.3719	21.4428	22.8588 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	249.4730	252.0617	245.5382	231.6503	214.1193	197.6426	186.6352	184.0465	190.5701	204.4579	221.9889	238.4656 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.4893	36.4893	36.4893	36.4893	36.4893	36.4893	36.4893	36.4893	36.4893	36.4893	36.4893	36.4893 (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)	-107.9145	-107.9145	-107.9145	-107.9145	-107.9145	-107.9145	-107.9145	-107.9145	-107.9145	-107.9145	-107.9145	-107.9145 (71)
Water heating gains (Table 5)	71.8700	69.6010	64.8791	58.4414	54.2598	48.3764	43.3818	49.7879	52.0688	58.7310	66.2386	69.6023 (72)
Total internal gains	410.0516	407.8846	392.9502	368.7219	343.9385	320.1624	304.7785	311.0825	323.5760	348.0288	376.1383	397.3946 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d	Gains W	
Northeast				8.3730	11.2829	0.7300		0.7200		0.7700	34.4106 (75)	
Southeast				6.0470	36.7938	0.7300		0.7200		0.7700	81.0408 (77)	
Southwest				0.8120	36.7938	0.7300		0.7200		0.7700	10.8823 (79)	
Northwest				6.1640	11.2829	0.7300		0.7200		0.7700	25.3322 (81)	

Solar gains	151.6659	278.1872	433.3375	625.2756	781.0020	810.8255	766.9608	645.3590	498.9506	321.6680	185.2746	127.4560 (83)
Total gains	561.7175	686.0718	826.2878	993.9974	1124.9404	1130.9879	1071.7393	956.4415	822.5266	669.6968	561.4128	524.8506 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)

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	13.5293	13.5584	13.5871	13.7236	13.7495	13.8711	13.8711	13.8938	13.8240	13.7495	13.6973	13.6432
alpha	1.9020	1.9039	1.9058	1.9149	1.9166	1.9247	1.9247	1.9263	1.9216	1.9166	1.9132	1.9095
util living area	0.9401	0.9132	0.8668	0.7834	0.6682	0.5377	0.4300	0.4818	0.6718	0.8413	0.9196	0.9467 (86)
MIT	17.5081	17.8962	18.5433	19.3710	20.0899	20.5878	20.8116	20.7583	20.3216	19.3698	18.2896	17.4336 (87)
Th 2	19.8203	19.8225	19.8247	19.8349	19.8369	19.8458	19.8458	19.8475	19.8424	19.8369	19.8330	19.8289 (88)
util rest of house	0.9327	0.9026	0.8503	0.7557	0.6239	0.4701	0.3378	0.3886	0.6106	0.8144	0.9081	0.9401 (89)
MIT 2	15.2519	15.8013	16.7134	17.8644	18.8298	19.4650	19.7162	19.6706	19.1638	17.8934	16.3722	15.1478 (90)
Living area fraction	15.6957	16.2135	17.0734	18.1608	19.0777	19.6858	19.9317	19.8846	19.3915	18.1839	16.7494	15.5975 (92)
Temperature adjustment	15.5457	16.0635	16.9234	18.0108	18.9277	19.5358	19.7817	19.7346	19.2415	18.0339	16.5994	15.4475 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8900	0.8523	0.7940	0.7014	0.5836	0.4499	0.3323	0.3785	0.5728	0.7580	0.8592	0.9001 (94)
Useful gains	499.9339	584.7412	656.0526	697.2363	656.4987	508.8348	356.0871	362.0067	471.1468	507.6077	482.3487	472.4023 (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	1429.9432	1416.4295	1319.7312	1142.0690	904.3161	612.1487	394.5948	412.8826	639.8321	930.1093	1193.0720	1418.2259 (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	691.9269	558.8945	493.7769	320.2795	184.3761	0.0000	0.0000	0.0000	0.0000	314.3412	511.7208	703.6928 (98)
Space heating												
Space heating per m2												

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8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													4189.5884 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	691.9269	558.8945	493.7769	320.2795	184.3761	0.0000	0.0000	0.0000	0.0000	314.3412	511.7208	703.6928	(98)
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000	(210)
Space heating fuel (main heating system)	767.1030	619.6170	547.4245	355.0771	204.4081	0.0000	0.0000	0.0000	0.0000	348.4936	567.3180	780.1472	(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	108.0926	94.2819	97.8383	87.6082	85.2529	74.9266	71.8353	80.8491	81.3057	92.5400	98.3847	104.7822	(64)
Efficiency of water heater (217)m	88.0511	87.9080	87.5838	86.8313	85.3268	76.4000	76.4000	76.4000	76.4000	86.6407	87.6470	76.4000	(216)
Fuel for water heating, kWh/month	122.7613	107.2506	111.7082	100.8947	99.9134	98.0714	94.0252	105.8234	106.4211	106.8090	112.2511	118.8861	(219)
Water heating fuel used												1284.8156	(219)
Annual totals kWh/year													
Space heating fuel - main system												4189.5884	(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)												392.7777	(232)
Total delivered energy for all uses												5942.1817	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4189.5884	0.2160	904.9511	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1284.8156	0.2160	277.5202	(264)
Space and water heating			1182.4713	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	392.7777	0.5190	203.8516	(268)
Total CO2, kg/year			1425.2479	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			14.8700	(273)

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

DER			14.8700	ZC1
Total Floor Area		TFA	95.8700	
Assumed number of occupants		N	2.6979	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			15.4201	ZC2
CO2 emissions from cooking, equation (L16)			1.9166	ZC3
Total CO2 emissions			32.2067	ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year			0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000	ZC7
Net CO2 emissions			32.2067	ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	48.5500 (1b)	x 2.3600 (2b)	= 114.5780 (1b) - (3b)
First floor	47.3200 (1c)	x 2.6300 (2c)	= 124.4516 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	95.8700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 239.0296 (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					5.0000
Infiltration rate					0.3755 (18)
Number of sides sheltered					1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3473 (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	0.4429	0.4342	0.4255	0.3821	0.3734	0.3300	0.3300	0.3213	0.3473	0.3734	0.3908	0.4081 (22b)
Effective ac	0.5981	0.5943	0.5905	0.5730	0.5697	0.5544	0.5544	0.5516	0.5603	0.5697	0.5763	0.5833 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.0400	1.0000	2.0400		(26)
TER Opening Type (Uw = 1.40)			21.4000	1.3258	28.3580		(27)
Flr - Ground			48.5530	0.1300	6.3119		(28a)
Wl - Brick (Timber Frame)	61.8070	17.9090	43.8980	0.1800	7.9016		(29a)
Wl - Clad (Timber Frame)	38.8060	5.5240	33.2820	0.1800	5.9908		(29a)
Rf - Ins Joist	47.3200		47.3200	0.1300	6.1516		(30)
Rf - Flat over Bay	1.2300		1.2300	0.1300	0.1599		(30)
Total net area of external elements Aum(A, m ²)			197.7130				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		56.9137		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.5662 (36)
Total fabric heat loss						(33) + (36) =	68.4799 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	47.1752	46.8748	46.5804	45.1975	44.9388	43.7343	43.7343	43.5112	44.1982	44.9388	45.4622	46.0094 (38)
Heat transfer coeff	115.6551	115.3547	115.0603	113.6774	113.4187	112.2142	112.2142	111.9912	112.6782	113.4187	113.9421	114.4893 (39)
Average = Sum(39)m / 12 =												113.6762 (39)
HLP	1.2064	1.2032	1.2002	1.1857	1.1830	1.1705	1.1705	1.1682	1.1753	1.1830	1.1885	1.1942 (40)
HLP (average)												1.1857 (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												2.6979 (42)
Average daily hot water use (litres/day)												98.2742 (43)
Daily hot water use	108.1017	104.1707	100.2397	96.3088	92.3778	88.4468	88.4468	92.3778	96.3088	100.2397	104.1707	108.1017 (44)
Energy conte	160.3117	140.2096	144.6837	126.1388	121.0332	104.4424	96.7813	111.0579	112.3843	130.9731	142.9673	155.2533 (45)
Energy content (annual)										Total = Sum(45)m =		1546.2366 (45)
Distribution loss (46)m = 0.15 x (45)m	24.0467	21.0314	21.7026	18.9208	18.1550	15.6664	14.5172	16.6587	16.8576	19.6460	21.4451	23.2880 (46)
Water storage loss:												
Total storage loss												

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

	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	50.9589	46.0274	50.9589	47.4947	47.0747	43.6176	45.0715	47.0747	47.4947	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	211.2706	186.2370	195.6427	173.6335	168.1079	148.0600	141.8528	158.1326	159.8790	181.9320	192.2824	206.2122 (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	211.2706	186.2370	195.6427	173.6335	168.1079	148.0600	141.8528	158.1326	159.8790	181.9320	192.2824	206.2122 (64)
Heat gains from water heating, kWh/month	66.0434	58.1265	60.8471	53.8148	52.0122	45.6315	43.4477	48.6954	49.2415	56.2883	59.8654	64.3614 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	134.8932	134.8932	134.8932	134.8932	134.8932	134.8932	134.8932	134.8932	134.8932	134.8932	134.8932	134.8932	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.2403	19.7536	16.0647	12.1620	9.0913	7.6752	8.2933	10.7800	14.4689	18.3716	21.4424	22.8584	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	249.4730	252.0617	245.5382	231.6503	214.1193	197.6426	186.6352	184.0465	190.5701	204.4579	221.9889	238.4656	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.4893	36.4893	36.4893	36.4893	36.4893	36.4893	36.4893	36.4893	36.4893	36.4893	36.4893	36.4893	(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)	-107.9145	-107.9145	-107.9145	-107.9145	-107.9145	-107.9145	-107.9145	-107.9145	-107.9145	-107.9145	-107.9145	-107.9145	(71)
Water heating gains (Table 5)	88.7679	86.4978	81.7837	74.7428	69.9089	63.3771	58.3974	65.4509	68.3909	75.6563	83.1464	86.5073	(72)
Total internal gains	426.9491	424.7811	409.8545	385.0230	359.5874	335.1629	319.7939	326.7453	339.8978	364.9538	393.0456	414.2992	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
Northeast					8.3730	11.2829	0.6300	0.7000	0.7700		28.8719 (75)	
Southeast					6.0470	36.7938	0.6300	0.7000	0.7700		67.9965 (77)	
Southwest					0.8120	36.7938	0.6300	0.7000	0.7700		9.1307 (79)	
Northwest					6.1640	11.2829	0.6300	0.7000	0.7700		21.2548 (81)	
Solar gains	127.2539	233.4105	363.5880	524.6319	655.2927	680.3159	643.5116	541.4827	418.6401	269.8927	155.4530	106.9408 (83)
Total gains	554.2030	658.1916	773.4425	909.6549	1014.8801	1015.4788	963.3055	868.2280	758.5379	634.8464	548.4986	521.2400 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	57.5646	57.7145	57.8622	58.5661	58.6997	59.3297	59.3297	59.4479	59.0854	58.6997	58.4300	58.1507	
alpha	4.8376	4.8476	4.8575	4.9044	4.9133	4.9553	4.9553	4.9632	4.9390	4.9133	4.8953	4.8767	
util living area	0.9983	0.9958	0.9870	0.9512	0.8465	0.6646	0.5033	0.5744	0.8417	0.9774	0.9964	0.9987	(86)
MIT	19.6636	19.8340	20.1215	20.5034	20.8094	20.9578	20.9913	20.9840	20.8644	20.4556	19.9909	19.6367	(87)
Th 2	19.9149	19.9174	19.9199	19.9314	19.9336	19.9437	19.9437	19.9456	19.9398	19.9336	19.9292	19.9246	(88)
util rest of house	0.9977	0.9943	0.9823	0.9331	0.7945	0.5719	0.3873	0.4522	0.7676	0.9659	0.9948	0.9983	(89)
MIT 2	18.1354	18.3857	18.8047	19.3537	19.7518	19.9167	19.9406	19.9392	19.8316	19.2983	18.6239	18.1029	(90)
Living area fraction	0.9977	0.9943	0.9823	0.9331	0.7945	0.5719	0.3873	0.4522	0.7676	0.9659	0.9948	0.9983	(89)
MIT	18.4360	18.6706	19.0638	19.5799	19.9599	20.1215	20.1473	20.1447	20.0347	19.5260	18.8928	18.4046	(92)
Temperature adjustment	18.4360	18.6706	19.0638	19.5799	19.9599	20.1215	20.1473	20.1447	20.0347	19.5260	18.8928	18.4046	(92)
adjusted MIT	18.4360	18.6706	19.0638	19.5799	19.9599	20.1215	20.1473	20.1447	20.0347	19.5260	18.8928	18.4046	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9965	0.9918	0.9771	0.9256	0.7960	0.5884	0.4102	0.4762	0.7753	0.9598	0.9926	0.9974	(94)
Useful gains	552.2449	652.7762	755.7513	841.9783	807.8458	597.5478	395.1154	413.4399	588.0761	609.3258	544.4374	519.8599	(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	1634.9024	1588.5061	1445.5903	1214.0633	936.8218	619.5925	398.0581	419.3724	668.7167	1012.3752	1343.7010	1626.2755	(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	805.4972	628.8105	513.2402	267.9012	95.9582	0.0000	0.0000	0.0000	0.0000	299.8687	575.4698	823.1732	(98)
Space heating												4009.9189	(98)
Space heating per m2												41.8266	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													4293.2751 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	805.4972	628.8105	513.2402	267.9012	95.9582	0.0000	0.0000	0.0000	0.0000	299.8687	575.4698	823.1732	(98)
Space heating efficiency (main heating system 1)	93.4000	93.4000	93.4000	93.4000	93.4000	0.0000	0.0000	0.0000	0.0000	93.4000	93.4000	93.4000	(210)
Space heating fuel (main heating system)	862.4167	673.2446	549.5077	286.8321	102.7389	0.0000	0.0000	0.0000	0.0000	321.0586	616.1347	881.3417	(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	211.2706	186.2370	195.6427	173.6335	168.1079	148.0600	141.8528	158.1326	159.8790	181.9320	192.2824	206.2122	(64)
Efficiency of water heater (217)m	88.0976	87.8745	87.3672	86.1393	83.6981	80.3000	80.3000	80.3000	80.3000	86.3011	87.6393	88.1782	(216)
Fuel for water heating, kWh/month	239.8143	211.9353	223.9315	201.5728	200.8503	184.3836	176.6535	196.9273	199.1022	210.8106	219.4021	233.8584	(219)
Water heating fuel used												2499.2419	(219)
Annual totals kWh/year													
Space heating fuel - main system												4293.2751	(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)												392.7701	(232)
Total delivered energy for all uses												7260.2871	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	4293.2751	0.2160	927.3474 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2499.2419	0.2160	539.8363 (264)
Space and water heating			1467.1837 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	392.7701	0.5190	203.8477 (268)
Total CO2, kg/m2/year			1709.9564 (272)
Emissions per m2 for space and water heating			15.3039 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.1263 (272b)
Emissions per m2 for pumps and fans			0.4060 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.3039 * 1.00) + 2.1263 + 0.4060, rounded to 2 d.p.			17.8400 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

Property Reference	089 - PRJ013014	Issued on Date	03/06/2025
Assessment Reference	089	Prop Type Ref	D-SP
Property	4 Moorman Road, Netley Abbey, SOUTHAMPTON, SO31 5JU		

SAP Rating	85 B	DER	14.87	TER	17.84
Environmental	87 B	% DER<TER	16.63		
CO ₂ Emissions (t/year)	1.19	DFEE	48.90	TFEE	54.80
General Requirements Compliance	Pass	% DFEE<TFEE	10.77		

Assessor Details	Mr. Christopher Nicholls, Briary Energy Limited, Tel: 0203 397 1373, chris@briaryenergy.co.uk	Assessor ID	U903-0001
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Client	
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CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	48.5500 (1b)	x 2.3600 (2b)	= 114.5780 (1b) - (3b)
First floor	47.3200 (1c)	x 2.6300 (2c)	= 124.4516 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	95.8700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 239.0296 (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					4 * 10 = 40.0000 (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) =					40.0000 / (5) = 0.1673 (8)
Pressure test					Yes
Measured/design AP50					3.8200
Infiltration rate					0.3583 (18)
Number of sides sheltered					1 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3315 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.9000	4.6000	4.5000	4.2000	4.2000	4.1000	4.1000	4.0000	4.0000	4.3000	4.3000	4.4000 (22)
Wind factor	1.2250	1.1500	1.1250	1.0500	1.0500	1.0250	1.0250	1.0000	1.0000	1.0750	1.0750	1.1000 (22a)
Adj infilt rate	0.4060	0.3812	0.3729	0.3480	0.3480	0.3398	0.3398	0.3315	0.3315	0.3563	0.3563	0.3646 (22b)
Effective ac	0.5824	0.5727	0.5695	0.5606	0.5606	0.5577	0.5577	0.5549	0.5549	0.5635	0.5635	0.5665 (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
Solid Door			2.0400	1.2000	2.4480		(26)
Windows (Uw = 1.40)			21.4000	1.3258	28.3580		(27)
Floor - Ground			48.5530	0.1800	8.7395	75.6000	3670.6068 (28a)
W1 - Brick (Timber Frame)	61.8070	17.9090	43.8980	0.2100	9.2186	7.4000	324.8452 (29a)
W1 - Clad (Timber Frame)	38.8060	5.5240	33.2820	0.2100	6.9892	7.4000	246.2868 (29a)
Rf - Ins Joist	47.3200		47.3200	0.0800	3.7856	7.4000	350.1680 (30a)
Rf - Flat over Bay	1.2300		1.2300	0.1700	0.2091	9.0000	11.0700 (30)
Total net area of external elements Aum(A, m ²)			197.7130				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		59.7480		(33)
Party Wall			43.9660	0.0000	0.0000	7.4000	325.3484 (32)
Stud			76.2760			7.4000	564.4425 (32c)
Internal Floor			47.3200			7.4000	350.1680 (32d)
Internal Ceiling			47.3200			7.4000	350.1680 (32e)
Heat capacity Cm = Sum (A x k)							(28)...(30) + (32) + (32a)...(32e) = 6193.1037 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							64.5990 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							20.9223 (36)
Total fabric heat loss							(33) + (36) = 80.6703 (37)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	45.9425	45.1707	44.9242	44.2173	44.2173	43.9925	43.9925	43.7732	43.7732	44.4475	44.4475	44.6832	(38)
Heat transfer coeff	126.6128	125.8410	125.5945	124.8876	124.8876	124.6628	124.6628	124.4435	124.4435	125.1178	125.1178	125.3535	(39)
Average = Sum(39)m / 12 =												125.1354	(39)
HLP	1.3207	1.3126	1.3101	1.3027	1.3027	1.3003	1.3003	1.2980	1.2980	1.3051	1.3051	1.3075	(40)
HLP (average)												1.3053	(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													2.6979	(42)
Average daily hot water use (litres/day)													98.2742	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Daily hot water use	108.1017	104.1707	100.2397	96.3088	92.3778	88.4468	88.4468	92.3778	96.3088	100.2397	104.1707	108.1017	(44)	
Energy conte	160.3117	140.2096	144.6837	126.1388	121.0332	104.4424	96.7813	111.0579	112.3843	130.9731	142.9673	155.2533	(45)	
Energy content (annual)										Total = Sum(45)m =		1546.2366	(45)	
Distribution loss (46)m = 0.15 x (45)m	24.0467	21.0314	21.7026	18.9208	18.1550	15.6664	14.5172	16.6587	16.8576	19.6460	21.4451	23.2880	(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	0.6707	0.6087	0.6508	0.5467	0.5031	0.4157	0.3852	0.4617	0.4871	0.5892	0.6206	0.6496	(61)	
Total heat required for water heating calculated for each month	160.9824	140.8183	145.3346	126.6855	121.5363	104.8581	97.1665	111.5196	112.8714	131.5622	143.5880	155.9028	(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	160.9824	140.8183	145.3346	126.6855	121.5363	104.8581	97.1665	111.5196	112.8714	131.5622	143.5880	155.9028	(64)	
RHI water heating demand										Total per year (kWh/year) = Sum(64)m =		1552.8256	(64)	
Heat gains from water heating, kWh/month	53.4713	46.7719	48.2701	42.0778	40.3693	34.8310	32.2761	37.0422	37.4895	43.6958	47.6918	51.7841	(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	161.8718	161.8718	161.8718	161.8718	161.8718	161.8718	161.8718	161.8718	161.8718	161.8718	161.8718	161.8718	(66)	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.6017	49.3850	40.1626	30.4056	22.7286	19.1884	20.7338	26.9505	36.1729	45.9299	53.6069	57.1471	(67)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	372.3477	376.2115	366.4749	345.7467	319.5810	294.9890	278.5601	274.6962	284.4329	305.1611	331.3267	355.9187	(68)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.8850	53.8850	53.8850	53.8850	53.8850	53.8850	53.8850	53.8850	53.8850	53.8850	53.8850	53.8850	(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)	-107.9145	-107.9145	-107.9145	-107.9145	-107.9145	-107.9145	-107.9145	-107.9145	-107.9145	-107.9145	-107.9145	-107.9145	(71)	
Water heating gains (Table 5)	71.8700	69.6010	64.8791	58.4414	54.2598	48.3764	43.3818	49.7879	52.0688	58.7310	66.2386	69.6023	(72)	
Total internal gains	610.6618	606.0398	582.3588	545.4360	507.4117	473.3962	453.5179	462.2770	483.5170	520.6642	562.0146	593.5104	(73)	

6. Solar gains

[Jan]			Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W					
Northeast			8.3730	14.6130	0.7300	0.7200	0.7700	44.5667 (75)					
Southeast			6.0470	45.0642	0.7300	0.7200	0.7700	99.2567 (77)					
Southwest			0.8120	45.0642	0.7300	0.7200	0.7700	13.3283 (79)					
Northwest			6.1640	14.6130	0.7300	0.7200	0.7700	32.8089 (81)					
Solar gains	189.9607	298.1774	476.3355	697.4956	823.6598	944.4441	863.3855	755.6459	579.8127	377.8318	231.6531	156.7021	(83)
Total gains	800.6225	904.2172	1058.6943	1242.9316	1331.0715	1417.8402	1316.9034	1217.9228	1063.3297	898.4960	793.6677	750.2125	(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	13.5871	13.6705	13.6973	13.7748	13.7748	13.7997	13.7997	13.8240	13.8240	13.7495	13.7495	13.7236		
alpha	1.9058	1.9114	1.9132	1.9183	1.9183	1.9200	1.9200	1.9216	1.9216	1.9166	1.9166	1.9149		
util living area	0.8820	0.8541	0.7918	0.6868	0.5559	0.3897	0.2886	0.3003	0.5078	0.7180	0.8391	0.8911	(86)	
MIT	18.2990	18.5718	19.1656	19.8772	20.4544	20.8158	20.9306	20.9279	20.6798	20.0203	19.0988	18.2702	(87)	
Th 2	19.8247	19.8310	19.8330	19.8387	19.8387	19.8406	19.8406	19.8424	19.8424	19.8369	19.8369	19.8349	(88)	

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Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

util rest of house	0.8678	0.8370	0.7674	0.6502	0.5014	0.3155	0.1950	0.2005	0.4292	0.6729	0.8164	0.8777 (89)
MIT 2	16.3686	16.7499	17.5731	18.5375	19.2836	19.7003	19.8086	19.8104	19.5739	18.7592	17.5027	16.3333 (90)
Living area fraction									fLA = Living area / (4) =			0.1967 (91)
MIT	16.7484	17.1083	17.8864	18.8011	19.5139	19.9198	20.0293	20.0302	19.7915	19.0073	17.8167	16.7144 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.5984	16.9583	17.7364	18.6511	19.3639	19.7698	19.8793	19.8802	19.6415	18.8573	17.6667	16.5644 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8127	0.7803	0.7122	0.6065	0.4768	0.3106	0.1983	0.2039	0.4141	0.6269	0.7598	0.8239	(94)
Useful gains	650.7013	705.5842	754.0418	753.8265	634.6369	440.4481	261.1614	248.3598	440.2956	563.2687	603.0001	618.1021	(95)
Ext temp.	5.7000	6.1000	7.7000	10.1000	13.1000	15.9000	17.7000	17.8000	15.5000	12.3000	8.8000	5.8000	(96)
Heat loss rate W	1379.8746	1366.4239	1260.5174	1067.9248	782.2832	482.4162	271.6791	258.8721	515.3802	820.4357	1109.3794	1349.3488	(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	542.5050	444.0843	376.8179	226.1508	109.8488	0.0000	0.0000	0.0000	0.0000	191.3322	364.5931	544.0475	(98)
Space heating												2799.3795	(98)
RHI space heating demand												2799	(98)

FULL SAP CALCULATION PRINTOUT

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CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	48.5500 (1b)	x 2.3600 (2b)	= 114.5780 (1b) - (3b)
First floor	47.3200 (1c)	x 2.6300 (2c)	= 124.4516 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	95.8700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 239.0296 (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					4 * 10 = 40.0000 (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) =					40.0000 / (5) = 0.1673 (8)
Pressure test					Yes
Measured/design AP50					3.8200
Infiltration rate					0.3583 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3315 (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	0.4226	0.4143	0.4060	0.3646	0.3563	0.3149	0.3149	0.3066	0.3315	0.3563	0.3729	0.3895 (22b)
Effective ac	0.5893	0.5858	0.5824	0.5665	0.5635	0.5496	0.5496	0.5470	0.5549	0.5635	0.5695	0.5758 (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
Solid Door			2.0400	1.2000	2.4480		(26)
Windows (Uw = 1.40)			21.4000	1.3258	28.3580		(27)
Flr - Ground			48.5530	0.1800	8.7395	75.6000	3670.6068 (28a)
Wl - Brick (Timber Frame)	61.8070	17.9090	43.8980	0.2100	9.2186	7.4000	324.8452 (29a)
Wl - Clad (Timber Frame)	38.8060	5.5240	33.2820	0.2100	6.9892	7.4000	246.2868 (29a)
Rf - Ins Joist	47.3200		47.3200	0.0800	3.7856	7.4000	350.1680 (30)
Rf - Flat over Bay	1.2300		1.2300	0.1700	0.2091	9.0000	11.0700 (30)
Total net area of external elements Aum(A, m ²)			197.7130				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	59.7480		(33)
Party Wall			43.9660	0.0000	0.0000	7.4000	325.3484 (32)
Stud			76.2760			7.4000	564.4425 (32c)
Internal Floor			47.3200			7.4000	350.1680 (32d)
Internal Ceiling			47.3200			7.4000	350.1680 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 6193.1037 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							64.5990 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							20.9223 (36)
Total fabric heat loss							(33) + (36) = 80.6703 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	46.4842	46.2106	45.9425	44.6832	44.4475	43.3507	43.3507	43.1476	43.7732	44.4475	44.9242	45.4225 (38)
Heat transfer coeff	127.1545	126.8809	126.6128	125.3535	125.1178	124.0210	124.0210	123.8178	124.4435	125.1178	125.5945	126.0928 (39)
Average = Sum(39)m / 12 =												125.3523 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3263	1.3235	1.3207	1.3075	1.3051	1.2936	1.2936	1.2915	1.2980	1.3051	1.3101	1.3152 (40)
HLP (average)												1.3075 (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												2.6979 (42)
Average daily hot water use (litres/day)												98.2742 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	108.1017	104.1707	100.2397	96.3088	92.3778	88.4468	88.4468	92.3778	96.3088	100.2397	104.1707	108.1017 (44)
Energy conte	160.3117	140.2096	144.6837	126.1388	121.0332	104.4424	96.7813	111.0579	112.3843	130.9731	142.9673	155.2533 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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Energy content (annual)												Total = Sum (45)m =	1546.2366 (45)
Distribution loss (46)m = 0.15 x (45)m													
24.0467	21.0314	21.7026	18.9208	18.1550	15.6664	14.5172	16.6587	16.8576	19.6460	21.4451	23.2880 (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	0.6707	0.6087	0.6508	0.5467	0.5031	0.4157	0.3852	0.4617	0.4871	0.5892	0.6206	0.6496 (61)	
Total heat required for water heating calculated for each month													
160.9824	140.8183	145.3346	126.6855	121.5363	104.8581	97.1665	111.5196	112.8714	131.5622	143.5880	155.9028 (62)		
WWHRS	-52.8897	-46.5364	-47.4963	-39.0773	-36.2834	-29.9315	-25.3312	-30.6705	-31.5656	-39.0222	-45.2032	-51.1206 eq. (G10)	
Total of WWHRS savings												-475.1281	
Solar input	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													
108.0926	94.2819	97.8383	87.6082	85.2529	74.9266	71.8353	80.8491	81.3057	92.5400	98.3847	104.7822 (64)		
Heat gains from water heating, kWh/month													
53.4713	46.7719	48.2701	42.0778	40.3693	34.8310	32.2761	37.0422	37.4895	43.6958	47.6918	51.7841 (65)		

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

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	161.8718	161.8718	161.8718	161.8718	161.8718	161.8718	161.8718	161.8718	161.8718	161.8718	161.8718	161.8718	
55.6017	49.3850	40.1626	30.4056	22.7286	19.1884	20.7338	26.9505	36.1729	45.9299	53.6069	57.1471	(67)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	372.3477	376.2115	366.4749	345.7467	319.5810	294.9890	278.5601	274.6962	284.4329	305.1611	331.3267	355.9187	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.8850	53.8850	53.8850	53.8850	53.8850	53.8850	53.8850	53.8850	53.8850	53.8850	53.8850	53.8850	(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)	-107.9145	-107.9145	-107.9145	-107.9145	-107.9145	-107.9145	-107.9145	-107.9145	-107.9145	-107.9145	-107.9145	-107.9145	(71)
Water heating gains (Table 5)	71.8700	69.6010	64.8791	58.4414	54.2598	48.3764	43.3818	49.7879	52.0688	58.7310	66.2386	69.6023	(72)
Total internal gains	610.6618	606.0398	582.3588	545.4360	507.4117	473.3962	453.5179	462.2770	483.5170	520.6642	562.0146	593.5104	(73)

6. Solar gains

[Jan]				Area	Solar flux		g	FF			Access			Gains
				m2	Table 6a		Specific data	Specific data			factor			W
					W/m2		or Table 6b	or Table 6c			Table 6d			
Northeast				8.3730	11.2829		0.7300	0.7200			0.7700			34.4106 (75)
Southeast				6.0470	36.7938		0.7300	0.7200			0.7700			81.0408 (77)
Southwest				0.8120	36.7938		0.7300	0.7200			0.7700			10.8823 (79)
Northwest				6.1640	11.2829		0.7300	0.7200			0.7700			25.3322 (81)
Solar gains	151.6659	278.1872	433.3375	625.2756	781.0020	810.8255	766.9608	645.3590	498.9506	321.6680	185.2746	127.4560 (83)		
Total gains	762.3277	884.2270	1015.6964	1170.7116	1288.4137	1284.2217	1220.4787	1107.6359	982.4676	842.3323	747.2891	720.9664 (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	13.5293	13.5584	13.5871	13.7236	13.7495	13.8711	13.8711	13.8938	13.8240	13.7495	13.6973	13.6432	
alpha	1.9020	1.9039	1.9058	1.9149	1.9166	1.9247	1.9247	1.9263	1.9216	1.9166	1.9132	1.9095	
util living area	0.9037	0.8737	0.8239	0.7378	0.6232	0.4943	0.3891	0.4333	0.6126	0.7868	0.8768	0.9119	(86)
MIT	17.8602	18.2164	18.8078	19.5588	20.2032	20.6469	20.8428	20.8008	20.4310	19.5894	18.5959	17.7869	(87)
Th 2	19.8203	19.8225	19.8247	19.8349	19.8369	19.8458	19.8458	19.8475	19.8424	19.8369	19.8330	19.8289	(88)
util rest of house	0.8927	0.8595	0.8038	0.7073	0.5777	0.4284	0.3026	0.3452	0.5497	0.7545	0.8605	0.9018	(89)
MIT 2	15.7454	16.2457	17.0731	18.1088	18.9650	19.5241	19.7395	19.7047	19.2846	18.1805	16.7956	15.6445	(90)
Living area fraction													
MIT	16.1614	16.6333	17.4144	18.3941	19.2086	19.7450	19.9565	19.9203	19.5101	18.4576	17.1497	16.0660	(92)
Temperature adjustment												-0.1500	
adjusted MIT	16.0114	16.4833	17.2644	18.2441	19.0586	19.5950	19.8065	19.7703	19.3601	18.3076	16.9997	15.9160	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation	0.8406	0.8037	0.7468	0.6571	0.5432	0.4127	0.2995	0.3388	0.5196	0.7005	0.8051	0.8515	(94)	
Useful gains	640.7942	710.6559	758.5140	769.2796	699.8056	530.0580	365.4966	375.2146	510.4717	590.0940	601.6754	613.8774	(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	1489.1630	1469.7061	1362.9052	1171.3109	920.6938	619.4840	397.6787	417.3064	654.5883	964.3630	1243.3512	1477.2980	(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	631.1863	510.0817	449.6670	289.4625	164.3408	0.0000	0.0000	0.0000	0.0000	278.4562	462.0066	642.3849	(98)	
Space heating												3427.5860	(98)	
Space heating per m2												(98) / (4) =	35.7524	(99)

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8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3799.9845 (211)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	631.1863	510.0817	449.6670	289.4625	164.3408	0.0000	0.0000	0.0000	0.0000	278.4562	462.0066	642.3849	(98)
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000	(210)
Space heating fuel (main heating system)	699.7631	565.5008	498.5222	320.9119	182.1960	0.0000	0.0000	0.0000	0.0000	308.7097	512.2024	712.1784	(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	108.0926	94.2819	97.8383	87.6082	85.2529	74.9266	71.8353	80.8491	81.3057	92.5400	98.3847	104.7822	(64)
Efficiency of water heater (217)m	87.8791	87.7280	87.3796	86.5670	84.9584	76.4000	76.4000	76.4000	76.4000	86.3112	87.4275	76.4000	(216)
Fuel for water heating, kWh/month	123.0016	107.4707	111.9693	101.2027	100.3467	98.0714	94.0252	105.8234	106.4211	107.2166	112.5329	119.1092	(219)
Water heating fuel used												1287.1910	(219)
Annual totals kWh/year													
Space heating fuel - main system												3799.9845	(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)												392.7777	(232)
Total delivered energy for all uses												5554.9531	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3799.9845	3.4800	132.2395 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1287.1910	3.4800	44.7942 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	392.7777	13.1900	51.8074 (250)
Additional standing charges			120.0000 (251)
Total energy cost			358.7336 (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] =	1.0696 (257)
SAP value		85.0797
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	3799.9845	0.2160	820.7967 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1287.1910	0.2160	278.0332 (264)
Space and water heating			1098.8299 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	392.7777	0.5190	203.8516 (268)
Total kg/year			1341.6065 (272)
CO2 emissions per m2			13.9900 (273)
EI value			87.2382
EI rating			87 (274)
EI band			B

Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9020 = 3.858$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9020 = 0.2395$, stars = 4
Water heating energy efficiency	$3.48 / 0.8349 = 4.168$, stars = 5
Water heating environmental impact	$0.216 / 0.8349 = 0.2587$, stars = 5

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	48.5500 (1b)	x 2.3600 (2b)	= 114.5780 (1b) - (3b)
First floor	47.3200 (1c)	x 2.6300 (2c)	= 124.4516 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	95.8700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 239.0296 (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					4 * 10 = 40.0000 (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) =					40.0000 / (5) = 0.1673 (8)
Pressure test					Yes
Measured/design AP50					3.8200
Infiltration rate					0.3583 (18)
Number of sides sheltered					1 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3315 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.9000	4.6000	4.5000	4.2000	4.2000	4.1000	4.1000	4.0000	4.0000	4.3000	4.3000	4.4000 (22)
Wind factor	1.2250	1.1500	1.1250	1.0500	1.0500	1.0250	1.0250	1.0000	1.0000	1.0750	1.0750	1.1000 (22a)
Adj infilt rate	0.4060	0.3812	0.3729	0.3480	0.3480	0.3398	0.3398	0.3315	0.3315	0.3563	0.3563	0.3646 (22b)
Effective ac	0.5824	0.5727	0.5695	0.5606	0.5606	0.5577	0.5577	0.5549	0.5549	0.5635	0.5635	0.5665 (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
Solid Door			2.0400	1.2000	2.4480		(26)
Windows (Uw = 1.40)			21.4000	1.3258	28.3580		(27)
Flr - Ground			48.5530	0.1800	8.7395	75.6000	3670.6068 (28a)
Wl - Brick (Timber Frame)	61.8070	17.9090	43.8980	0.2100	9.2186	7.4000	324.8452 (29a)
Wl - Clad (Timber Frame)	38.8060	5.5240	33.2820	0.2100	6.9892	7.4000	246.2868 (29a)
Rf - Ins Joist	47.3200		47.3200	0.0800	3.7856	7.4000	350.1680 (30)
Rf - Flat over Bay	1.2300		1.2300	0.1700	0.2091	9.0000	11.0700 (30)
Total net area of external elements Aum(A, m ²)			197.7130				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	59.7480		(33)
Party Wall			43.9660	0.0000	0.0000	7.4000	325.3484 (32)
Stud			76.2760			7.4000	564.4425 (32c)
Internal Floor			47.3200			7.4000	350.1680 (32d)
Internal Ceiling			47.3200			7.4000	350.1680 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 6193.1037 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							64.5990 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							20.9223 (36)
Total fabric heat loss							(33) + (36) = 80.6703 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	45.9425	45.1707	44.9242	44.2173	44.2173	43.9925	43.9925	43.7732	43.7732	44.4475	44.4475	44.6832 (38)
Heat transfer coeff	126.6128	125.8410	125.5945	124.8876	124.8876	124.6628	124.6628	124.4435	124.4435	125.1178	125.1178	125.3535 (39)
Average = Sum(39)m / 12 =												125.1354 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3207	1.3126	1.3101	1.3027	1.3027	1.3003	1.3003	1.2980	1.2980	1.3051	1.3051	1.3075 (40)
HLP (average)												1.3053 (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												2.6979 (42)
Average daily hot water use (litres/day)												98.2742 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	108.1017	104.1707	100.2397	96.3088	92.3778	88.4468	88.4468	92.3778	96.3088	100.2397	104.1707	108.1017 (44)
Energy conte	160.3117	140.2096	144.6837	126.1388	121.0332	104.4424	96.7813	111.0579	112.3843	130.9731	142.9673	155.2533 (45)

Energy content (annual)										Total = Sum(45)m =			1546.2366 (45)
Distribution loss (46)m = 0.15 x (45)m													
	24.0467	21.0314	21.7026	18.9208	18.1550	15.6664	14.5172	16.6587	16.8576	19.6460	21.4451	23.2880 (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	0.6707	0.6087	0.6508	0.5467	0.5031	0.4157	0.3852	0.4617	0.4871	0.5892	0.6206	0.6496 (61)	
Total heat required for water heating calculated for each month													
	160.9824	140.8183	145.3346	126.6855	121.5363	104.8581	97.1665	111.5196	112.8714	131.5622	143.5880	155.9028 (62)	
WWHRS	-52.8897	-46.5364	-47.4963	-39.0773	-36.2834	-29.9315	-25.3312	-30.6705	-31.5656	-39.0222	-45.2032	-51.1206 eq. (G10)	
Total of WWHRS savings													
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	108.0926	94.2819	97.8383	87.6082	85.2529	74.9266	71.8353	80.8491	81.3057	92.5400	98.3847	104.7822 (64)	
	Total per year (kWh/year) = Sum(64)m = 1077.6976 (64)												
Heat gains from water heating, kWh/month	53.4713	46.7719	48.2701	42.0778	40.3693	34.8310	32.2761	37.0422	37.4895	43.6958	47.6918	51.7841 (65)	

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	161.8718	161.8718	161.8718	161.8718	161.8718	161.8718	161.8718	161.8718	161.8718	161.8718	161.8718	161.8718 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.6017	49.3850	40.1626	30.4056	22.7286	19.1884	20.7338	26.9505	36.1729	45.9299	53.6069	57.1471 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	372.3477	376.2115	366.4749	345.7467	319.5810	294.9890	278.5601	274.6962	284.4329	305.1611	331.3267	355.9187 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.8850	53.8850	53.8850	53.8850	53.8850	53.8850	53.8850	53.8850	53.8850	53.8850	53.8850	53.8850 (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)	-107.9145	-107.9145	-107.9145	-107.9145	-107.9145	-107.9145	-107.9145	-107.9145	-107.9145	-107.9145	-107.9145	-107.9145 (71)
Water heating gains (Table 5)	71.8700	69.6010	64.8791	58.4414	54.2598	48.3764	43.3818	49.7879	52.0688	58.7310	66.2386	69.6023 (72)
Total internal gains	610.6618	606.0398	582.3588	545.4360	507.4117	473.3962	453.5179	462.2770	483.5170	520.6642	562.0146	593.5104 (73)

[Jan				Area	Solar flux	g		FF	Access		Gains	
				m2	Table 6a	Specific data		Specific data	factor		W	
					W/m2	or Table 6b		or Table 6c	Table 6d			
Northeast				8.3730	14.6130	0.7300		0.7200	0.7700		44.5667 (75)	
Southeast				6.0470	45.0642	0.7300		0.7200	0.7700		99.2567 (77)	
Southwest				0.8120	45.0642	0.7300		0.7200	0.7700		32.3283 (79)	
Northwest				6.1640	14.6130	0.7300		0.7200	0.7700		13.8089 (81)	

Solar gains	189.9607	298.1774	476.3355	697.4956	823.6598	944.4441	863.3855	755.6459	579.8127	377.8318	231.6531	156.7021 (83)
Total gains	800.6225	904.2172	1058.6943	1242.9316	1331.0715	1417.8402	1316.9034	1217.9228	1063.3297	898.4960	793.6677	750.2125 (84)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, n _{li,m} (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	13.5871	13.6705	13.6973	13.7748	13.7748	13.7997	13.7997	13.8240	13.8240	13.7495	13.7495	13.7236
alpha	1.9058	1.9114	1.9132	1.9183	1.9183	1.9200	1.9200	1.9216	1.9216	1.9166	1.9166	1.9149
util living area	0.8820	0.8541	0.7918	0.6868	0.5559	0.3897	0.2886	0.3003	0.5078	0.7180	0.8391	0.8911 (86)
MIT	18.2990	18.5718	19.1656	19.8772	20.4544	20.8158	20.9306	20.9279	20.6798	20.0203	19.0988	18.2702 (87)
Th 2	19.8247	19.8310	19.8330	19.8387	19.8387	19.8406	19.8406	19.8424	19.8424	19.8369	19.8369	19.8349 (88)
util rest of house	0.8678	0.8370	0.7674	0.6502	0.5014	0.3155	0.1950	0.2005	0.4292	0.6729	0.8164	0.8777 (89)
MIT 2	16.3686	16.7499	17.5731	18.5375	19.2836	19.7003	19.8086	19.8104	19.5739	18.7592	17.5027	16.3333 (90)
Living area fraction									fLA = Living area / (4) =			0.1967 (91)
MIT	16.7484	17.1083	17.8864	18.8011	19.5139	19.9198	20.0293	20.0302	19.7915	19.0073	17.8167	16.7144 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.5984	16.9583	17.7364	18.6511	19.3639	19.7698	19.8793	19.8802	19.6415	18.8573	17.6667	16.5644 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8127	0.7803	0.7122	0.6065	0.4768	0.3106	0.1983	0.2039	0.4141	0.6269	0.7598	0.8239 (94)
Useful gains	650.7013	705.5842	754.0418	753.8265	634.6369	440.4481	261.1614	248.3598	440.2956	563.2687	603.0001	618.1021 (95)
Ext temp.	5.7000	6.1000	7.7000	10.1000	13.1000	15.9000	17.7000	17.8000	15.5000	12.3000	8.8000	5.8000 (96)
Heat loss rate W	1379.8746	1366.4239	1260.5174	1067.9248	782.2832	482.4162	271.6791	258.8721	515.3802	820.4357	1109.3794	1349.3488 (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	542.5050	444.0843	376.8179	226.1508	109.8488	0.0000	0.0000	0.0000	0.0000	191.3322	364.5931	544.0475 (98)
Space heating												2799.3795 (98)
Space heating per m2												29.1997 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3103.5249 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	542.5050	444.0843	376.8179	226.1508	109.8488	0.0000	0.0000	0.0000	0.0000	191.3322	364.5931	544.0475	(98)
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000	(210)
Space heating fuel (main heating system)	601.4467	492.3329	417.7582	250.7215	121.7836	0.0000	0.0000	0.0000	0.0000	212.1200	404.2052	603.1569	(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	108.0926	94.2819	97.8383	87.6082	85.2529	74.9266	71.8353	80.8491	81.3057	92.5400	98.3847	104.7822	(64)
Efficiency of water heater (217)m	87.5719	87.4342	86.9622	85.8692	83.6015	76.4000	76.4000	76.4000	76.4000	85.1841	86.8657	76.4000	(216)
Fuel for water heating, kWh/month	123.4330	107.8318	112.5066	102.0252	101.9754	98.0714	94.0252	105.8234	106.4211	108.6353	113.2607	119.5552	(219)
Water heating fuel used													1293.5644 (219)
Annual totals kWh/year													
Space heating fuel - main system													3103.5249 (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)													392.7777 (232)
Total delivered energy for all uses													4864.8670 (238)

10a. Fuel costs - using BEDF prices (572)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3103.5249	5.7300	177.8320 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1293.5644	5.7300	74.1212 (247)
Pumps and fans for heating	75.0000	24.1800	18.1350 (249)
Energy for lighting	392.7777	24.1800	94.9736 (250)
Additional standing charges			114.0000 (251)
Total energy cost			479.0619 (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	3103.5249	0.2160	670.3614 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1293.5644	0.2160	279.4099 (264)
Space and water heating			949.7713 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	392.7777	0.5190	203.8516 (268)
Total kg/year			1192.5479 (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	3103.5249	1.2200	3786.3004 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1293.5644	1.2200	1578.1486 (264)
Space and water heating			5364.4490 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	392.7777	3.0700	1205.8274 (268)
Primary energy kWh/year			6800.5264 (272)
Primary energy kWh/m2/year			70.9349 (273)

SAP 2012 EPC IMPROVEMENTS

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Current energy efficiency rating: B 85
Current environmental impact rating: B 87

(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		SAP increase too small
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
U Solar photovoltaic panels	+ 9.5	-£ 471	-1010 kg (84.7%)

Measures omitted - SAP change or cost saving too small:			
N Solar water heating	+ 0.9	-£ 34	-148 kg (12.4%)

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
Solar photovoltaic panels	£471	10.54 kg/m²	A 95
Total Savings	£471	10.54 kg/m²	A 96
Potential energy efficiency rating:			A 95
Potential environmental impact rating:			A 96

Fuel prices for cost data on this page from database revision number 572 TEST (30 May 2025)
Recommendation texts revision number 4.9c (22 Feb 2014)

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

	Current	Potential	Saving
Electricity	£113	£113	£0
Mains gas	£366	£366	£0
Space heating	£310	£310	£0
Water heating	£74	£74	£0
Lighting	£95	£95	£0
Generated (PV)	-£0	-£471	£471
Total cost of fuels	£479	£8	£471
Total cost of uses	£479	£8	£471
Delivered energy	51 kWh/m²	30 kWh/m²	20 kWh/m²
Carbon dioxide emissions	1.2 tonnes	0.2 tonnes	1.0 tonnes
CO2 emissions per m²	12 kg/m²	2 kg/m²	11 kg/m²
Primary energy	71 kWh/m²	9 kWh/m²	62 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	48.5500 (1b)	x 2.3600 (2b)	= 114.5780 (1b) - (3b)
First floor	47.3200 (1c)	x 2.6300 (2c)	= 124.4516 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	95.8700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 239.0296 (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					4 * 10 = 40.0000 (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) =					40.0000 / (5) = 0.1673 (8)
Pressure test					Yes
Measured/design AP50					3.8200
Infiltration rate					0.3583 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3315 (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	0.4226	0.4143	0.4060	0.3646	0.3563	0.3149	0.3149	0.3066	0.3315	0.3563	0.3729	0.3895 (22b)
Effective ac	0.5893	0.5858	0.5824	0.5665	0.5635	0.5496	0.5496	0.5470	0.5549	0.5635	0.5695	0.5758 (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
Solid Door			2.0400	1.2000	2.4480		(26)
Windows (Uw = 1.40)			21.4000	1.3258	28.3580		(27)
Flr - Ground			48.5530	0.1800	8.7395	75.6000	3670.6068 (28a)
Wl - Brick (Timber Frame)	61.8070	17.9090	43.8980	0.2100	9.2186	7.4000	324.8452 (29a)
Wl - Clad (Timber Frame)	38.8060	5.5240	33.2820	0.2100	6.9892	7.4000	246.2868 (29a)
Rf - Ins Joist	47.3200		47.3200	0.0800	3.7856	7.4000	350.1680 (30)
Rf - Flat over Bay	1.2300		1.2300	0.1700	0.2091	9.0000	11.0700 (30)
Total net area of external elements Aum(A, m ²)			197.7130				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	59.7480		(33)
Party Wall			43.9660	0.0000	0.0000	7.4000	325.3484 (32)
Stud			76.2760			7.4000	564.4425 (32c)
Internal Floor			47.3200			7.4000	350.1680 (32d)
Internal Ceiling			47.3200			7.4000	350.1680 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 6193.1037 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							64.5990 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							20.9223 (36)
Total fabric heat loss							(33) + (36) = 80.6703 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	46.4842	46.2106	45.9425	44.6832	44.4475	43.3507	43.3507	43.1476	43.7732	44.4475	44.9242	45.4225 (38)
Heat transfer coeff	127.1545	126.8809	126.6128	125.3535	125.1178	124.0210	124.0210	123.8178	124.4435	125.1178	125.5945	126.0928 (39)
Average = Sum(39)m / 12 =												125.3523 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3263	1.3235	1.3207	1.3075	1.3051	1.2936	1.2936	1.2915	1.2980	1.3051	1.3101	1.3152 (40)
HLP (average)												1.3075 (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												2.6979 (42)
Average daily hot water use (litres/day)												98.2742 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	108.1017	104.1707	100.2397	96.3088	92.3778	88.4468	88.4468	92.3778	96.3088	100.2397	104.1707	108.1017 (44)
Energy conte	160.3117	140.2096	144.6837	126.1388	121.0332	104.4424	96.7813	111.0579	112.3843	130.9731	142.9673	155.2533 (45)

Energy content (annual)												Total = Sum(45)m =	1546.2366 (45)
Distribution loss (46)m = 0.15 x (45)m													
	24.0467	21.0314	21.7026	18.9208	18.1550	15.6664	14.5172	16.6587	16.8576	19.6460	21.4451	23.2880 (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	0.6707	0.6087	0.6508	0.5467	0.5031	0.4157	0.3852	0.4617	0.4871	0.5892	0.6206	0.6496 (61)	
Total heat required for water heating calculated for each month	160.9824	140.8183	145.3346	126.6855	121.5363	104.8581	97.1665	111.5196	112.8714	131.5622	143.5880	155.9028 (62)	
WWHRS	-52.8887	-46.5364	-47.4963	-39.0773	-36.2834	-29.9315	-25.3312	-30.6705	-31.5656	-39.0222	-45.2032	-51.1206 eq. (G10)	
Total of WWHRS savings												-475.1281	
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 (64)	
Output from w/h	108.0926	94.2819	97.8383	87.6082	85.2529	74.9266	71.8353	80.8491	81.3057	92.5400	98.3847	104.7822 (63)	
								Total per year (kWh/year) =	Sum(64)m =			1077.6976 (64)	
Heat gains from water heating, kWh/month	53.4713	46.7719	48.2701	42.0778	40.3693	34.8310	32.2761	37.0422	37.4895	43.6958	47.6918	51.7841 (65)	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8406	0.8037	0.7468	0.6571	0.5432	0.4127	0.2995	0.3388	0.5196	0.7005	0.8051	0.8515 (94)
Useful gains	640.7942	710.6559	758.5140	769.2796	699.8056	530.0580	365.4966	375.2146	510.4717	590.0940	601.6754	613.8774 (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	1489.1630	1469.7061	1362.9052	1171.3109	920.6938	619.4840	397.6787	417.3064	654.5883	964.3630	1243.3512	1477.2980 (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	631.1863	510.0817	449.6670	289.4625	164.3408	0.0000	0.0000	0.0000	0.0000	278.4562	462.0066	642.3849 (98)
Space heating												3427.5860 (98)
Space heating per m2												35.7524 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3799.9845 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	631.1863	510.0817	449.6670	289.4625	164.3408	0.0000	0.0000	0.0000	0.0000	278.4562	462.0066	642.3849	(98)
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000	(210)
Space heating fuel (main heating system)	699.7631	565.5008	498.5222	320.9119	182.1960	0.0000	0.0000	0.0000	0.0000	308.7097	512.2024	712.1784	(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	108.0926	94.2819	97.8383	87.6082	85.2529	74.9266	71.8353	80.8491	81.3057	92.5400	98.3847	104.7822	(64)
Efficiency of water heater (217)m	87.8791	87.7280	87.3796	86.5670	84.9584	76.4000	76.4000	76.4000	76.4000	86.3112	87.4275	76.4000	(216)
Fuel for water heating, kWh/month	123.0016	107.4707	111.9693	101.2027	100.3467	98.0714	94.0252	105.8234	106.4211	107.2166	112.5329	119.1092	(219)
Water heating fuel used												1287.1910	(219)
Annual totals kWh/year													
Space heating fuel - main system												3799.9845	(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)												392.7777	(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												3827.7137	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3799.9845	3.4800	132.2395 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1287.1910	3.4800	44.7942 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	392.7777	13.1900	51.8074 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-1727.2394	13.1900	-227.8229 (252)
Total energy cost			130.9107 (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] =	0.3903 (257)
SAP value		94.5552
SAP rating (Section 12)		95 (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
Space heating - main system 1	3799.9845	0.2160	820.7967 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1287.1910	0.2160	278.0332 (264)
Space and water heating			1098.8299 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	392.7777	0.5190	203.8516 (268)
Energy saving/generation technologies			
PV Unit	-1727.2394	0.5190	-896.4372 (269)
Total kg/year			445.1693 (272)
CO2 emissions per m2			4.6400 (273)
EI value			95.7654
EI rating			96 (274)
EI band			A

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	48.5500 (1b)	x 2.3600 (2b)	= 114.5780 (1b) - (3b)
First floor	47.3200 (1c)	x 2.6300 (2c)	= 124.4516 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	95.8700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 239.0296 (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					4 * 10 = 40.0000 (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) =					40.0000 / (5) = 0.1673 (8)
Pressure test					Yes
Measured/design AP50					3.8200
Infiltration rate					0.3583 (18)
Number of sides sheltered					1 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3315 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.9000	4.6000	4.5000	4.2000	4.2000	4.1000	4.1000	4.0000	4.0000	4.3000	4.3000	4.4000 (22)
Wind factor	1.2250	1.1500	1.1250	1.0500	1.0500	1.0250	1.0250	1.0000	1.0000	1.0750	1.0750	1.1000 (22a)
Adj infilt rate												
Effective ac	0.4060	0.3812	0.3729	0.3480	0.3480	0.3398	0.3398	0.3315	0.3315	0.3563	0.3563	0.3646 (22b)
	0.5824	0.5727	0.5695	0.5606	0.5606	0.5577	0.5577	0.5549	0.5549	0.5635	0.5635	0.5665 (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
Solid Door			2.0400	1.2000	2.4480		(26)
Windows (Uw = 1.40)			21.4000	1.3258	28.3580		(27)
Flr - Ground			48.5530	0.1800	8.7395	75.6000	3670.6068 (28a)
Wl - Brick (Timber Frame)	61.8070	17.9090	43.8980	0.2100	9.2186	7.4000	324.8452 (29a)
Wl - Clad (Timber Frame)	38.8060	5.5240	33.2820	0.2100	6.9892	7.4000	246.2868 (29a)
Rf - Ins Joist	47.3200		47.3200	0.0800	3.7856	7.4000	350.1680 (30)
Rf - Flat over Bay	1.2300		1.2300	0.1700	0.2091	9.0000	11.0700 (30)
Total net area of external elements Aum(A, m ²)			197.7130				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	59.7480		(33)
Party Wall			43.9660	0.0000	0.0000	7.4000	325.3484 (32)
Stud			76.2760			7.4000	564.4425 (32c)
Internal Floor			47.3200			7.4000	350.1680 (32d)
Internal Ceiling			47.3200			7.4000	350.1680 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 6193.1037 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							64.5990 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							20.9223 (36)
Total fabric heat loss							(33) + (36) = 80.6703 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	45.9425	45.1707	44.9242	44.2173	44.2173	43.9925	43.9925	43.7732	43.7732	44.4475	44.4475	44.6832 (38)
Heat transfer coeff	126.6128	125.8410	125.5945	124.8876	124.8876	124.6628	124.6628	124.4435	124.4435	125.1178	125.1178	125.3535 (39)
Average = Sum(39)m / 12 =												125.1354 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3207	1.3126	1.3101	1.3027	1.3027	1.3003	1.3003	1.2980	1.2980	1.3051	1.3051	1.3075 (40)
HLP (average)												1.3053 (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												2.6979 (42)
Average daily hot water use (litres/day)												98.2742 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	108.1017	104.1707	100.2397	96.3088	92.3778	88.4468	88.4468	92.3778	96.3088	100.2397	104.1707	108.1017 (44)
Energy conte	160.3117	140.2096	144.6837	126.1388	121.0332	104.4424	96.7813	111.0579	112.3843	130.9731	142.9673	155.2533 (45)

Energy content (annual)												Total = Sum(45)m =	1546.2366 (45)
Distribution loss (46)m = 0.15 x (45)m													
	24.0467	21.0314	21.7026	18.9208	18.1550	15.6664	14.5172	16.6587	16.8576	19.6460	21.4451	23.2880 (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	0.6707	0.6087	0.6508	0.5467	0.5031	0.4157	0.3852	0.4617	0.4871	0.5892	0.6206	0.6496 (61)	
Total heat required for water heating calculated for each month	160.9824	140.8183	145.3346	126.6855	121.5363	104.8581	97.1665	111.5196	112.8714	131.5622	143.5880	155.9028 (62)	
WWHRS	-52.8887	-46.5364	-47.4963	-39.0773	-36.2834	-29.9315	-25.3312	-30.6705	-31.5656	-39.0222	-45.2032	-51.1206 eq. (G10)	
Total of WWHRS savings												-475.1281	
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 (64)	
Output from w/h	108.0926	94.2819	97.8383	87.6082	85.2529	74.9266	71.8353	80.8491	81.3057	92.5400	98.3847	104.7822 (64)	
								Total per year (kWh/year) =	Sum(64)m =			1077.6976 (64)	
Heat gains from water heating, kWh/month	53.4713	46.7719	48.2701	42.0778	40.3693	34.8310	32.2761	37.0422	37.4895	43.6958	47.6918	51.7841 (65)	

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	161.8718	161.8718	161.8718	161.8718	161.8718	161.8718	161.8718	161.8718	161.8718	161.8718	161.8718	161.8718 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.6017	49.3850	40.1626	30.4056	22.7286	19.1884	20.7338	26.9505	36.1729	45.9299	53.6069	57.1471 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	372.3477	376.2115	366.4749	345.7467	319.5810	294.9890	278.5601	274.6962	284.4329	305.1611	331.3267	355.9187 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.8850	53.8850	53.8850	53.8850	53.8850	53.8850	53.8850	53.8850	53.8850	53.8850	53.8850	53.8850 (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)	-107.9145	-107.9145	-107.9145	-107.9145	-107.9145	-107.9145	-107.9145	-107.9145	-107.9145	-107.9145	-107.9145	-107.9145 (71)
Water heating gains (Table 5)	71.8700	69.6010	64.8791	58.4414	54.2598	48.3764	43.3818	49.7879	52.0688	58.7310	66.2386	69.6023 (72)
Total internal gains	610.6618	606.0398	582.3588	545.4360	507.4117	473.3962	453.5179	462.2770	483.5170	520.6642	562.0146	593.5104 (73)

[Jan					Area	Solar flux	g		FF			Access	Gains
					m2	Table 6a	Specific data		Specific data			factor	W
						W/m2	or Table 6b		or Table 6c			Table 6d	
Northeast					8.3730	14.6130	0.7300		0.7200			0.7700	44.5667 (75)
Southeast					6.0470	45.0642	0.7300		0.7200			0.7700	99.2567 (77)
Southwest					0.8120	45.0642	0.7300		0.7200			0.7700	13.3283 (79)
Northwest					6.1640	14.6130	0.7300		0.7200			0.7700	32.8089 (81)

Solar gains	189.9607	298.1774	476.3355	697.4956	823.6598	944.4441	863.3855	755.6459	579.8127	377.8318	231.6531	156.7021 (83)	
Total gains	800.6225	904.2172	1058.6943	1242.9316	1331.0715	1417.8402	1316.9034	1217.9228	1063.3297	898.4960	793.6677	750.2125 (84)	

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, n _{l,m} (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	13.5871	13.6705	13.6973	13.7748	13.7748	13.7997	13.7997	13.8240	13.8240	13.7495	13.7495	13.7236
alpha	1.9058	1.9114	1.9132	1.9183	1.9183	1.9200	1.9200	1.9216	1.9216	1.9166	1.9166	1.9149
util living area	0.8820	0.8541	0.7918	0.6868	0.5559	0.3897	0.2886	0.3003	0.5078	0.7180	0.8391	0.8911 (86)
MIT	18.2990	18.5718	19.1656	19.8772	20.4544	20.8158	20.9306	20.9279	20.6798	20.0203	19.0988	18.2702 (87)
Th 2	19.8247	19.8310	19.8330	19.8387	19.8387	19.8406	19.8406	19.8424	19.8424	19.8369	19.8369	19.8349 (88)
util rest of house	0.8678	0.8370	0.7674	0.6502	0.5014	0.3155	0.1950	0.2005	0.4292	0.6729	0.8164	0.8777 (89)
MIT 2	16.3686	16.7499	17.5731	18.5375	19.2836	19.7003	19.8086	19.8104	19.5739	18.7592	17.5027	16.3333 (90)
Living area fraction									fLA = Living area / (4) =			0.1967 (91)
MIT	16.7484	17.1083	17.8864	18.8011	19.5139	19.9198	20.0293	20.0302	19.7915	19.0073	17.8167	16.7144 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.5984	16.9583	17.7364	18.6511	19.3639	19.7698	19.8793	19.8802	19.6415	18.8573	17.6667	16.5644 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8127	0.7803	0.7122	0.6065	0.4768	0.3106	0.1983	0.2039	0.4141	0.6269	0.7598	0.8239 (94)
Useful gains	650.7013	705.5842	754.0418	753.8265	634.6369	440.4481	261.1614	248.3598	440.2956	563.2687	603.0001	618.1021 (95)
Ext temp.	5.7000	6.1000	7.7000	10.1000	13.1000	15.9000	17.7000	17.8000	15.5000	12.3000	8.8000	5.8000 (96)
Heat loss rate W	1379.8746	1366.4239	1260.5174	1067.9248	782.2832	482.4162	271.6791	258.8721	515.3802	820.4357	1109.3794	1349.3488 (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	542.5050	444.0843	376.8179	226.1508	109.8488	0.0000	0.0000	0.0000	0.0000	191.3322	364.5931	544.0475 (98)
Space heating												2799.3795 (98)
Space heating per m2												29.1997 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



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

Primary energy kWh/year	824.9374 (272)
Primary energy kWh/m2/year	8.6047 (273)

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Built)

Property Reference	089 - PRJ013014	Issued on Date	03/06/2025
Assessment Reference	089	Prop Type Ref	D-SP
Property	4 Moorman Road, Netley Abbey, SOUTHAMPTON, SO31 5JU		
SAP Rating	85 B	DER	14.87
Environmental	87 B	TER	17.84
CO ₂ Emissions (t/year)	1.19	% DER<TER	16.63
General Requirements Compliance	Pass	DFEE	48.90
		TFEE	54.80
		% DFEE<TFEE	10.77
Assessor Details	Mr. Christopher Nicholls, Briary Energy Limited, Tel: 0203 397 1373, chris@briaryenergy.co.uk		Assessor ID
			U903-0001
Client			

SUMMARY FOR INPUT DATA FOR New Build (As Built)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	17.84	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.87	kgCO ₂ /m ²	Pass
	-2.97 (-16.6%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	54.80	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	48.90	kWh/m ² /yr	
	-5.9 (-10.8%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.21 (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	0.08 (max. 0.20)	0.17 (max. 0.35)	Pass
Openings	1.38 (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	3.82 (measured in this dwelling)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Built)

Main heating system

Boiler system with radiators or underfloor - Mains gas
Data from database
Vaillant ecoFIT sustain 835 VUW 356/6-3 (H-GB)
Combi boiler
Efficiency: 89.3% SEDBUK2009
Minimum: 88.0%

Pass

Secondary heating system

None

5 Cylinder insulation

Hot water storage

No cylinder

6 Controls

Space heating controls

Time and temperature zone control

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 (Southern England)

Slight

Pass

Based on:

Overshading

Average

Windows facing North East

8.37 m², No overhang

Windows facing South East

6.05 m², No overhang

Windows facing South West

0.81 m², No overhang

Windows facing North West

6.16 m², No overhang

Air change rate

4.68 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

3.82 (measured in this dwelling)

Maximum

10.0

Pass

10 Key features

Party wall U-value

0.00

W/m²K

Roof U-value

0.08

W/m²K

Air permeability

3.8

m³/m²h

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Built)

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.