

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

Property Reference	041 - PRJ013014	Issued on Date	02/05/2024
Assessment Reference	041	Prop Type Ref	C
Property	25 Deeble way, Netley Abbey, Southampton, SO31 5JP		

SAP Rating	85 B	DER	14.31	TER	17.29
Environmental	88 B	% DER<TER	17.22		
CO ₂ Emissions (t/year)	1.14	DFEE	44.01	TTEE	49.67
General Requirements Compliance	Pass	% DFEE<TFEE	11.39		

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	47.7200 (1b)	x 2.3700 (2b)	= 113.0964 (1b) - (3b)
First floor	47.7200 (1c)	x 2.6200 (2c)	= 125.0264 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	95.4400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 238.1228 (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) = 0.1680 (8)
Pressure test					Yes
Measured/design AP50					4.4800
Infiltration rate					0.3920 (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) = 0.3626 (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 infiltr rate	0.4442	0.4170	0.4079	0.3807	0.3807	0.3716	0.3716	0.3626	0.3626	0.3898	0.3898	0.3988 (22b)
Effective ac	0.5986	0.5869	0.5832	0.5725	0.5725	0.5691	0.5691	0.5657	0.5657	0.5760	0.5760	0.5795 (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			2.0900	1.2000	2.5080		(26)
Windows (Uw = 1.40)			11.5800	1.3258	15.3390		(27)
Fir - Ground			47.7150	0.1800	8.5887	75.6000	3607.2540 (28a)
Wl - Brick (Timber Frame)	97.6560	13.6650	83.9910	0.2100	17.6381	7.4000	621.5334 (29a)
Rf - Ins Joist	47.7150		47.7150	0.0800	3.8172	7.4000	353.0910 (30)
Total net area of external elements Aum(A, m ²)			193.0810				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	47.8910		(33)
Party Wall			46.7690	0.0000	0.0000	7.4000	346.0906 (32)
Stud			74.4133			7.4000	550.6581 (32c)
Internal Floor			47.7150			7.4000	353.0910 (32d)
Internal Ceiling			47.7150			7.4000	353.0910 (32e)
Heat capacity Cm = Sum (A x k)							(28)...(30) + (32) + (32a)...(32e) = 6184.8091 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							64.8031 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							16.8602 (36)
Total fabric heat loss							(33) + (36) = 64.7512 (37)

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

(38)m	Jan 47.0415	Feb 46.1214	Mar 45.8276	Apr 44.9850	May 44.9850	Jun 44.7171	Jul 44.7171	Aug 44.4556	Sep 44.4556	Oct 45.2594	Nov 45.2594	Dec 45.5403 (38)
Heat transfer coeff	111.7927	110.8726	110.5788	109.7363	109.7363	109.4683	109.4683	109.2068	109.2068	110.0107	110.0107	110.2915 (39)
Average = Sum(39)m / 12 =												110.0316 (39)
HLP	Jan 1.1713	Feb 1.1617	Mar 1.1586	Apr 1.1498	May 1.1498	Jun 1.1470	Jul 1.1470	Aug 1.1442	Sep 1.1442	Oct 1.1527	Nov 1.1527	Dec 1.1556 (40)
HLP (average)												1.1529 (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												2.6931 (42)
Average daily hot water use (litres/day)												98.1614 (43)
Daily hot water use	Jan 107.9776	Feb 104.0511	Mar 100.1247	Apr 96.1982	May 92.2718	Jun 88.3453	Jul 88.3453	Aug 92.2718	Sep 96.1982	Oct 100.1247	Nov 104.0511	Dec 107.9776 (44)
Energy conte	160.1276	140.0487	144.5177	125.9940	120.8942	104.3225	96.6702	110.9304	112.2553	130.8227	142.8032	155.0751 (45)
Energy content (annual)										Total = Sum(45)m =		1544.4617 (45)
Distribution loss (46)m = 0.15 x (45)m	24.0191	21.0073	21.6777	18.8991	18.1341	15.6484	14.5005	16.6396	16.8383	19.6234	21.4205	23.2613 (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	0.6708	0.6086	0.6503	0.5454	0.5020	0.4147	0.3843	0.4606	0.4859	0.5887	0.6206	0.6496 (61)
Total heat required for water heating calculated for each month	160.7984	140.6573	145.1680	126.5394	121.3962	104.7373	97.0545	111.3910	112.7412	131.4114	143.4239	155.7247 (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	160.7984	140.6573	145.1680	126.5394	121.3962	104.7373	97.0545	111.3910	112.7412	131.4114	143.4239	155.7247 (64)
RHI water heating demand										Total per year (kWh/year) = Sum(64)m =		1551.0434 (64)
Heat gains from water heating, kWh/month	53.4101	46.7183	48.2147	42.0294	40.3228	34.7909	32.2389	36.9995	37.4464	43.6457	47.6372	51.7249 (65)

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

Metabolic gains (Table 5), Watts	Jan 161.5868	Feb 161.5868	Mar 161.5868	Apr 161.5868	May 161.5868	Jun 161.5868	Jul 161.5868	Aug 161.5868	Sep 161.5868	Oct 161.5868	Nov 161.5868	Dec 161.5868 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	61.0062	54.1851	44.0663	33.3610	24.9378	21.0535	22.7491	29.5701	39.6889	50.3942	58.8175	62.7017 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	371.2510	375.1034	365.3954	344.7283	318.6397	294.1202	277.7396	273.8872	283.5951	304.2623	330.3508	354.8704 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.8518	53.8518	53.8518	53.8518	53.8518	53.8518	53.8518	53.8518	53.8518	53.8518	53.8518	53.8518 (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)	-107.7245	-107.7245	-107.7245	-107.7245	-107.7245	-107.7245	-107.7245	-107.7245	-107.7245	-107.7245	-107.7245	-107.7245 (71)
Water heating gains (Table 5)	71.7878	69.5213	64.8047	58.3741	54.1974	48.3207	43.3319	49.7305	52.0089	58.6636	66.1628	69.5227 (72)
Total internal gains	614.7590	609.5239	584.9805	547.1775	508.4889	474.2085	454.5346	463.9018	486.0070	524.0342	566.0452	597.8088 (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				7.2440	25.1733		0.7300	0.7200	0.7700		66.4212 (76)	
South				0.7190	56.5862		0.7300	0.7200	0.7700		14.8193 (78)	
West				3.6130	25.1733		0.7300	0.7200	0.7700		33.1281 (80)	
Solar gains	114.3685	186.2398	303.4799	436.1292	498.0482	560.7068	516.7786	466.2876	368.2291	238.8239	141.2089	93.0706 (83)
Total gains	729.1275	795.7637	888.4604	983.3067	1006.5371	1034.9153	971.3131	930.1895	854.2360	762.8581	707.2541	690.8795 (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	15.3678	15.4953	15.5364	15.6557	15.6557	15.6941	15.6941	15.7316	15.7316	15.6167	15.6167	15.5769
alpha	2.0245	2.0330	2.0358	2.0437	2.0437	2.0463	2.0463	2.0488	2.0488	2.0411	2.0411	2.0385
util living area	0.8895	0.8682	0.8189	0.7346	0.6202	0.4565	0.3395	0.3424	0.5490	0.7437	0.8508	0.8965 (86)
MIT	18.5025	18.7297	19.2421	19.8748	20.4238	20.7960	20.9250	20.9264	20.6866	20.0756	19.2440	18.4962 (87)
Th 2	19.9430	19.9508	19.9532	19.9604	19.9604	19.9626	19.9626	19.9649	19.9649	19.9581	19.9581	19.9557 (88)
util rest of house	0.8769	0.8534	0.7981	0.7030	0.5705	0.3826	0.2432	0.2425	0.4760	0.7039	0.8308	0.8845 (89)
MIT 2	16.6904	17.0132	17.7348	18.6122	19.3442	19.7942	19.9231	19.9274	19.6846	18.9055	17.7535	16.6871 (90)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Living area fraction									fLA = Living area / (4) =	0.1539 (91)		
MIT	16.9693	17.2774	17.9668	18.8065	19.5104	19.9484	20.0773	20.0812	19.8389	19.0856	17.9829	16.9655 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.8193	17.1274	17.8168	18.6565	19.3604	19.7984	19.9273	19.9312	19.6889	18.9356	17.8329	16.8155 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8247	0.7997	0.7441	0.6558	0.5381	0.3700	0.2397	0.2391	0.4542	0.6563	0.7766	0.8336	(94)
Useful gains	601.2993	636.4067	661.1374	644.8950	541.6148	382.8678	232.8652	222.3776	388.0015	500.6513	549.2295	575.8906	(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													
Month fracti	1243.0611	1222.6325	1118.7064	938.9623	686.9904	426.7493	243.8220	232.7403	457.4527	729.9865	993.7207	1214.9203	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating	477.4707	393.9437	340.4313	211.7285	108.1594	0.0000	0.0000	0.0000	0.0000	170.6253	320.0337	475.4381	(98)
RHI space heating demand												2497.8307	(98)
												2498	(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	47.7200 (1b)	x 2.3700 (2b)	= 113.0964 (1b) - (3b)
First floor	47.7200 (1c)	x 2.6200 (2c)	= 125.0264 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	95.4400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 238.1228 (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) = 0.1680 (8)
Pressure test					Yes
Measured/design AP50					4.4800
Infiltration rate					0.3920 (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) =	0.3626 (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	0.4623	0.4532	0.4442	0.3988	0.3898	0.3445	0.3445	0.3354	0.3626	0.3898	0.4079	0.4260 (22b)
Effective ac	0.6069	0.6027	0.5986	0.5795	0.5760	0.5593	0.5593	0.5562	0.5657	0.5760	0.5832	0.5908 (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			2.0900	1.2000	2.5080		(26)
Windows (Uw = 1.40)			11.5800	1.3258	15.3390		(27)
Flr - Ground			47.7150	0.1800	8.5887	75.6000	3607.2540 (28a)
Wl - Brick (Timber Frame)	97.6560	13.6650	83.9910	0.2100	17.6381	7.4000	621.5334 (29a)
Rf - Ins Joist	47.7150		47.7150	0.0800	3.8172	7.4000	353.0910 (30)
Total net area of external elements Aum(A, m ²)			193.0810				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	47.8910		(33)
Party Wall			46.7690	0.0000	0.0000	7.4000	346.0906 (32)
Stud			74.4133			7.4000	550.6581 (32c)
Internal Floor			47.7150			7.4000	353.0910 (32d)
Internal Ceiling			47.7150			7.4000	353.0910 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 6184.8091 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							64.8031 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							16.8602 (36)
Total fabric heat loss							(33) + (36) = 64.7512 (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	47.6871	47.3611	47.0415	45.5403	45.2594	43.9520	43.9520	43.7098	44.4556	45.2594	45.8276	46.4216 (38)
Heat transfer coeff	112.4384	112.1123	111.7927	110.2915	110.0107	108.7032	108.7032	108.4611	109.2068	110.0107	110.5788	111.1729 (39)
Average = Sum(39)m / 12 =												110.2902 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1781	1.1747	1.1713	1.1556	1.1527	1.1390	1.1390	1.1364	1.1442	1.1527	1.1586	1.1648 (40)
HLP (average)												1.1556 (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												2.6931 (42)
Average daily hot water use (litres/day)												98.1614 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	107.9776	104.0511	100.1247	96.1982	92.2718	88.3453	88.3453	92.2718	96.1982	100.1247	104.0511	107.9776 (44)
Energy conte	160.1276	140.0487	144.5177	125.9940	120.8942	104.3225	96.6702	110.9304	112.2553	130.8227	142.8032	155.0751 (45)
Energy content (annual)										Total = Sum(45)m =		1544.4617 (45)
Distribution loss (46)m = 0.15 x (45)m												

	24.0191	21.0073	21.6777	18.8991	18.1341	15.6484	14.5005	16.6396	16.8383	19.6234	21.4205	23.2613 (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	0.6708	0.6086	0.6503	0.5454	0.5020	0.4147	0.3843	0.4606	0.4859	0.5887	0.6206	0.6496 (61)	
Total heat required for water heating calculated for each month	160.7984	140.6573	145.1680	126.5394	121.3962	104.7373	97.0545	111.3910	112.7412	131.4114	143.4239	155.7247 (62)	
WWHRS	-52.8094	-46.4657	-47.4242	-39.0182	-36.2287	-29.8865	-25.2932	-30.6245	-31.5182	-38.9634	-45.1348	-51.0429 eq. (G10)	
Total of WWHRS savings												-474.4098	
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	107.9890	94.1916	97.7438	87.5212	85.1676	74.8508	71.7613	80.7666	81.2231	92.4480	98.2890	104.6817 (64)	
								Total per year (kWh/year) = Sum(64)m =					1076.6336 (64)
Heat gains from water heating, kWh/month	53.4101	46.7183	48.2147	42.0294	40.3228	34.7909	32.2389	36.9995	37.4464	43.6457	47.6372	51.7249 (65)	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8496	0.8218	0.7756	0.7014	0.6024	0.4739	0.3492	0.3818	0.5582	0.7259	0.8181	0.8589 (94)
Useful gains	598.6811	642.2659	667.5846	660.0354	593.8922	455.3941	320.8480	330.5938	448.6611	526.9745	554.1538	577.4122 (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	1345.5603	1318.4269	1213.6993	1032.3730	807.6629	544.7078	353.0944	370.6336	579.9740	859.4716	1117.5409	1333.9537 (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	555.6781	454.3802	406.3093	268.0831	159.0454	0.0000	0.0000	0.0000	0.0000	247.3779	405.6387	562.8669 (98)
Space heating												3059.3795 (98)
Space heating per m2											(98) / (4) =	32.0555 (99)

FULL SAP CALCULATION PRINTOUT

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CALCULATION OF ENERGY RATINGS 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												90.2000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												3391.7733	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	555.6781	454.3802	406.3093	268.0831	159.0454	0.0000	0.0000	0.0000	0.0000	247.3779	405.6387	562.8669	(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)	616.0511	503.7474	450.4538	297.2096	176.3253	0.0000	0.0000	0.0000	0.0000	274.2549	449.7103	624.0209	(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	107.9890	94.1916	97.7438	87.5212	85.1676	74.8508	71.7613	80.7666	81.2231	92.4480	98.2890	104.6817	(64)
Efficiency of water heater (217)m	87.6246	87.4866	87.1475	86.3607	84.8548	76.4000	76.4000	76.4000	76.4000	85.9753	87.1303	87.7154	(216)
Fuel for water heating, kWh/month	123.2404	107.6640	112.1590	101.3438	100.3686	97.9723	93.9284	105.7154	106.3129	107.5286	112.8069	119.3424	(217)
Water heating fuel used												1288.3827	(219)
Annual totals kWh/year													
Space heating fuel - main system												3391.7733	(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)												430.9551	(232)
Total delivered energy for all uses												5186.1111	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3391.7733	3.4800	118.0337 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1288.3827	3.4800	44.8357 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	430.9551	13.1900	56.8430 (250)
Additional standing charges			120.0000 (251)
Total energy cost			349.6049 (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] = 1.0455 (257)
SAP value	85.4149
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	3391.7733	0.2160	732.6230 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1288.3827	0.2160	278.2907 (264)
Space and water heating			1010.9137 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	430.9551	0.5190	223.6657 (268)
Total kg/year			1273.5044 (272)
CO2 emissions per m2			13.3400 (273)
EI value			87.8489
EI rating			88 (274)
EI band			B

Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9020 = 3.858$, 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	$3.48 / 0.8332 = 4.176$, stars = 5
Water heating environmental impact	$0.216 / 0.8332 = 0.2592$, 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	47.7200 (1b)	x 2.3700 (2b)	= 113.0964 (1b) - (3b)
First floor	47.7200 (1c)	x 2.6200 (2c)	= 125.0264 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	95.4400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 238.1228 (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) = 0.1680 (8)
Pressure test					Yes
Measured/design AP50					4.4800
Infiltration rate					0.3920 (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) =				0.3626 (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	0.4442	0.4170	0.4079	0.3807	0.3807	0.3716	0.3716	0.3626	0.3626	0.3898	0.3898	0.3988 (22b)
Effective ac	0.5986	0.5869	0.5832	0.5725	0.5725	0.5691	0.5691	0.5657	0.5657	0.5760	0.5760	0.5795 (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			2.0900	1.2000	2.5080		(26)
Windows (Uw = 1.40)			11.5800	1.3258	15.3390		(27)
Flr - Ground			47.7150	0.1800	8.5887	75.6000	3607.2540 (28a)
Wl - Brick (Timber Frame)	97.6560	13.6650	83.9910	0.2100	17.6381	7.4000	621.5334 (29a)
Rf - Ins Joist	47.7150		47.7150	0.0800	3.8172	7.4000	353.0910 (30)
Total net area of external elements Aum(A, m ²)			193.0810				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	47.8910		(33)
Party Wall			46.7690	0.0000	0.0000	7.4000	346.0906 (32)
Stud			74.4133			7.4000	550.6581 (32c)
Internal Floor			47.7150			7.4000	353.0910 (32d)
Internal Ceiling			47.7150			7.4000	353.0910 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 6184.8091 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 64.8031 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 16.8602 (36)
Total fabric heat loss (33) + (36) = 64.7512 (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	47.0415	46.1214	45.8276	44.9850	44.9850	44.7171	44.7171	44.4556	44.4556	45.2594	45.2594	45.5403 (38)
Heat transfer coeff	111.7927	110.8726	110.5788	109.7363	109.7363	109.4683	109.4683	109.2068	109.2068	110.0107	110.0107	110.2915 (39)
Average = Sum(39)m / 12 =												110.0316 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1713	1.1617	1.1586	1.1498	1.1498	1.1470	1.1470	1.1442	1.1442	1.1527	1.1527	1.1556 (40)
HLP (average)												1.1529 (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												2.6931 (42)
Average daily hot water use (litres/day)												98.1614 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	107.9776	104.0511	100.1247	96.1982	92.2718	88.3453	88.3453	92.2718	96.1982	100.1247	104.0511	107.9776 (44)
Energy conte	160.1276	140.0487	144.5177	125.9940	120.8942	104.3225	96.6702	110.9304	112.2553	130.8227	142.8032	155.0751 (45)
Energy content (annual)										Total = Sum(45)m =		1544.4617 (45)
Distribution loss (46)m = 0.15 x (45)m												

	24.0191	21.0073	21.6777	18.8991	18.1341	15.6484	14.5005	16.6396	16.8383	19.6234	21.4205	23.2613 (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	0.6708	0.6086	0.6503	0.5454	0.5020	0.4147	0.3843	0.4606	0.4859	0.5887	0.6206	0.6496 (61)	
Total heat required for water heating calculated for each month	160.7984	140.6573	145.1680	126.5394	121.3962	104.7373	97.0545	111.3910	112.7412	131.4114	143.4239	155.7247 (62)	
WWHRS	-52.8094	-46.4657	-47.4242	-39.0182	-36.2287	-29.8865	-25.2932	-30.6245	-31.5182	-38.9634	-45.1348	-51.0429 eq. (G10)	
Total of WWHRS savings												-474.4098	
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	107.9890	94.1916	97.7438	87.5212	85.1676	74.8508	71.7613	80.7666	81.2231	92.4480	98.2890	104.6817 (64)	
								Total per year (kWh/year) = Sum(64)m =					1076.6336 (64)
Heat gains from water heating, kWh/month	53.4101	46.7183	48.2147	42.0294	40.3228	34.7909	32.2389	36.9995	37.4464	43.6457	47.6372	51.7249 (65)	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8247	0.7997	0.7441	0.6558	0.5381	0.3700	0.2397	0.2391	0.4542	0.6563	0.7766	0.8336 (94)
Useful gains	601.2993	636.4067	661.1374	644.8950	541.6148	382.8678	232.8652	222.3776	388.0015	500.6513	549.2295	575.8906 (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	1243.0611	1222.6325	1118.7064	938.9623	686.9904	426.7493	243.8220	232.7403	457.4527	729.9865	993.7207	1214.9203 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	477.4707	393.9437	340.4313	211.7285	108.1594	0.0000	0.0000	0.0000	0.0000	170.6253	320.0337	475.4381 (98)
Space heating												2497.8307 (98)
Space heating per m2												26.1717 (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													2769.2137 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	477.4707	393.9437	340.4313	211.7285	108.1594	0.0000	0.0000	0.0000	0.0000	170.6253	320.0337	475.4381	(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)	529.3467	436.7447	377.4183	234.7322	119.9106	0.0000	0.0000	0.0000	0.0000	189.1634	354.8045	527.0932	(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	107.9890	94.1916	97.7438	87.5212	85.1676	74.8508	71.7613	80.7666	81.2231	92.4480	98.2890	104.6817	(64)
Efficiency of water heater (217)m	87.2917	87.1620	86.7064	85.6740	83.5515	76.4000	76.4000	76.4000	76.4000	84.8162	86.5277	87.3528	(216)
Fuel for water heating, kWh/month	123.7105	108.0650	112.7297	102.1561	101.9342	97.9723	93.9284	105.7154	106.3129	108.9980	113.5925	119.8378	(219)
Water heating fuel used												1294.9526	(219)
Annual totals kWh/year													
Space heating fuel - main system												2769.2137	(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)													430.9551 (232)
Total delivered energy for all uses													4570.1214 (238)

10a. Fuel costs - using BEDF prices (540)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2769.2137	7.6100	210.7372 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1294.9526	7.6100	98.5459 (247)
Pumps and fans for heating	75.0000	31.0800	23.3100 (249)
Energy for lighting	430.9551	31.0800	133.9408 (250)
Additional standing charges			105.0000 (251)
Total energy cost			571.5339 (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	2769.2137	0.2160	598.1502 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1294.9526	0.2160	279.7098 (264)
Space and water heating			877.8599 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	430.9551	0.5190	223.6657 (268)
Total kg/year			1140.4506 (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	2769.2137	1.2200	3378.4407 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1294.9526	1.2200	1579.8422 (264)
Space and water heating			4958.2829 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	430.9551	3.0700	1323.0321 (268)
Primary energy kWh/year			6511.5650 (272)
Primary energy kWh/m2/year			68.2268 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:
Current environmental impact rating:

B 85
B 88

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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	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	-£ 605	-1010 kg (88.6%)
Measures omitted - SAP change or cost saving too small:			
N Solar water heating	+ 0.9	-£ 46	-148 kg (13.0%)

Recommended measures	Typical annual savings		Energy efficiency	Environmental impact
Solar photovoltaic panels	£605	10.58 kg/m ²	A 95	A 96
Total Savings	£605	10.58 kg/m ²		
Potential energy efficiency rating:			A 95	
Potential environmental impact rating:				A 96

Fuel prices for cost data on this page from database revision number 540 TEST (28 Mar 2024)
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	£157	£157	£0
Mains gas	£414	£414	£0
Space heating	£339	£339	£0
Water heating	£99	£99	£0
Lighting	£134	£134	£0
Generated (PV)	-£0	-£605	£605
Total cost of fuels	£571	-£34	£605
Total cost of uses	£572	-£33	£605
Delivered energy	48 kWh/m ²	27 kWh/m ²	20 kWh/m ²
Carbon dioxide emissions	1.1 tonnes	0.1 tonnes	1.0 tonnes
CO2 emissions per m ²	12 kg/m ²	1 kg/m ²	11 kg/m ²
Primary energy	68 kWh/m ²	6 kWh/m ²	63 kWh/m ²

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	47.7200 (1b)	x 2.3700 (2b)	= 113.0964 (1b) - (3b)
First floor	47.7200 (1c)	x 2.6200 (2c)	= 125.0264 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	95.4400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 238.1228 (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) = 0.1680 (8)
Pressure test					Yes
Measured/design AP50					4.4800
Infiltration rate					0.3920 (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) =	0.3626 (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	0.4623	0.4532	0.4442	0.3988	0.3898	0.3445	0.3445	0.3354	0.3626	0.3898	0.4079	0.4260 (22b)
Effective ac	0.6069	0.6027	0.5986	0.5795	0.5760	0.5593	0.5593	0.5562	0.5657	0.5760	0.5832	0.5908 (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			2.0900	1.2000	2.5080		(26)
Windows (Uw = 1.40)			11.5800	1.3258	15.3390		(27)
Flr - Ground			47.7150	0.1800	8.5887	75.6000	3607.2540 (28a)
Wl - Brick (Timber Frame)	97.6560	13.6650	83.9910	0.2100	17.6381	7.4000	621.5334 (29a)
Rf - Ins Joist	47.7150		47.7150	0.0800	3.8172	7.4000	353.0910 (30)
Total net area of external elements Aum(A, m ²)			193.0810				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	47.8910		(33)
Party Wall			46.7690	0.0000	0.0000	7.4000	346.0906 (32)
Stud			74.4133			7.4000	550.6581 (32c)
Internal Floor			47.7150			7.4000	353.0910 (32d)
Internal Ceiling			47.7150			7.4000	353.0910 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 6184.8091 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							64.8031 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							16.8602 (36)
Total fabric heat loss							(33) + (36) = 64.7512 (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	47.6871	47.3611	47.0415	45.5403	45.2594	43.9520	43.9520	43.7098	44.4556	45.2594	45.8276	46.4216 (38)
Heat transfer coeff	112.4384	112.1123	111.7927	110.2915	110.0107	108.7032	108.7032	108.4611	109.2068	110.0107	110.5788	111.1729 (39)
Average = Sum(39)m / 12 =												110.2902 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1781	1.1747	1.1713	1.1556	1.1527	1.1390	1.1390	1.1364	1.1442	1.1527	1.1586	1.1648 (40)
HLP (average)												1.1556 (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												2.6931 (42)
Average daily hot water use (litres/day)												98.1614 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	107.9776	104.0511	100.1247	96.1982	92.2718	88.3453	88.3453	92.2718	96.1982	100.1247	104.0511	107.9776 (44)
Energy conte	160.1276	140.0487	144.5177	125.9940	120.8942	104.3225	96.6702	110.9304	112.2553	130.8227	142.8032	155.0751 (45)
Energy content (annual)										Total = Sum(45)m =		1544.4617 (45)
Distribution loss (46)m = 0.15 x (45)m												

Water storage loss:	24.0191	21.0073	21.6777	18.8991	18.1341	15.6484	14.5005	16.6396	16.8383	19.6234	21.4205	23.2613 (46)
Total storage loss												
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 (56)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Total heat required for water heating calculated for each month	0.6708	0.6086	0.6503	0.5454	0.5020	0.4147	0.3843	0.4606	0.4859	0.5887	0.6206	0.6496 (61)
WWHRS	160.7984	140.6573	145.1680	126.5394	121.3962	104.7373	97.0545	111.3910	112.7412	131.4114	143.4239	155.7247 (62)
Total of WWHRS savings	-52.8094	-46.4657	-47.4242	-39.0182	-36.2287	-29.8865	-25.2932	-30.6245	-31.5182	-38.9634	-45.1348	-51.0429 eq. (G10)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-474.4098
Output from w/h								Solar input (sum of months) = Sum(63)m =				
	107.9890	94.1916	97.7438	87.5212	85.1676	74.8508	71.7613	80.7666	81.2231	92.4480	98.2890	104.6817 (64)
Heat gains from water heating, kWh/month								Total per year (kWh/year) = Sum(64)m =				
	53.4101	46.7183	48.2147	42.0294	40.3228	34.7909	32.2389	36.9995	37.4464	43.6457	47.6372	51.7249 (65)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8496	0.8218	0.7756	0.7014	0.6024	0.4739	0.3492	0.3818	0.5582	0.7259	0.8181	0.8589 (94)
Useful gains	598.6811	642.2659	667.5846	660.0354	593.8922	455.3941	320.8480	330.5938	448.6611	526.9745	554.1538	577.4122 (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	1345.5603	1318.4269	1213.6993	1032.3730	807.6629	544.7078	353.0944	370.6336	579.9740	859.4716	1117.5409	1333.9537 (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	555.6781	454.3802	406.3093	268.0831	159.0454	0.0000	0.0000	0.0000	0.0000	247.3779	405.6387	562.8669 (98)
Space heating												3059.3795 (98)
Space heating per m2												32.0555 (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													3391.7733 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	555.6781	454.3802	406.3093	268.0831	159.0454	0.0000	0.0000	0.0000	0.0000	247.3779	405.6387	562.8669	(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)	616.0511	503.7474	450.4538	297.2096	176.3253	0.0000	0.0000	0.0000	0.0000	274.2549	449.7103	624.0209	(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	107.9890	94.1916	97.7438	87.5212	85.1676	74.8508	71.7613	80.7666	81.2231	92.4480	98.2890	104.6817	(64)
Efficiency of water heater (217)m	87.6246	87.4866	87.1475	86.3607	84.8548	76.4000	76.4000	76.4000	76.4000	85.9753	87.1303	87.7154	(216)
Fuel for water heating, kWh/month	123.2404	107.6640	112.1590	101.3438	100.3686	97.9723	93.9284	105.7154	106.3129	107.5286	112.8069	119.3424	(219)
Water heating fuel used												1288.3827	(219)
Annual totals kWh/year													
Space heating fuel - main system												3391.7733	(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)												430.9551	(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												3458.8717	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3391.7733	3.4800	118.0337 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1288.3827	3.4800	44.8357 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	430.9551	13.1900	56.8430 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-1727.2394	13.1900	-227.8229 (252)
Total energy cost			121.7820 (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] =	0.3642 (257)
SAP value		94.9194
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	3391.7733	0.2160	732.6230 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1288.3827	0.2160	278.2907 (264)
Space and water heating			1010.9137 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	430.9551	0.5190	223.6657 (268)
Energy saving/generation technologies			
PV Unit	-1727.2394	0.5190	-896.4372 (269)
Total kg/year			377.0671 (272)
CO2 emissions per m2			3.9500 (273)
EI value			96.4022
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	47.7200 (1b)	x 2.3700 (2b)	= 113.0964 (1b) - (3b)
First floor	47.7200 (1c)	x 2.6200 (2c)	= 125.0264 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	95.4400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 238.1228 (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) = 0.1680 (8)
Pressure test					Yes
Measured/design AP50					4.4800
Infiltration rate					0.3920 (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) =				0.3626 (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	0.4442	0.4170	0.4079	0.3807	0.3807	0.3716	0.3716	0.3626	0.3626	0.3898	0.3898	0.3988 (22b)
Effective ac	0.5986	0.5869	0.5832	0.5725	0.5725	0.5691	0.5691	0.5657	0.5657	0.5760	0.5760	0.5795 (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			2.0900	1.2000	2.5080		(26)
Windows (Uw = 1.40)			11.5800	1.3258	15.3390		(27)
Flr - Ground			47.7150	0.1800	8.5887	75.6000	3607.2540 (28a)
Wl - Brick (Timber Frame)	97.6560	13.6650	83.9910	0.2100	17.6381	7.4000	621.5334 (29a)
Rf - Ins Joist	47.7150		47.7150	0.0800	3.8172	7.4000	353.0910 (30)
Total net area of external elements Aum(A, m ²)			193.0810				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	47.8910		(33)
Party Wall			46.7690	0.0000	0.0000	7.4000	346.0906 (32)
Stud			74.4133			7.4000	550.6581 (32c)
Internal Floor			47.7150			7.4000	353.0910 (32d)
Internal Ceiling			47.7150			7.4000	353.0910 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss

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	47.0415	46.1214	45.8276	44.9850	44.9850	44.7171	44.7171	44.4556	44.4556	45.2594	45.2594	45.5403 (38)
Heat transfer coeff	111.7927	110.8726	110.5788	109.7363	109.7363	109.4683	109.4683	109.2068	109.2068	110.0107	110.0107	110.2915 (39)
Average = Sum(39)m / 12 =												110.0316 (39)
HLP	1.1713	1.1617	1.1586	1.1498	1.1498	1.1470	1.1470	1.1442	1.1442	1.1527	1.1527	1.1556 (40)
HLP (average)												1.1529 (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												2.6931 (42)
Average daily hot water use (litres/day)												98.1614 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	107.9776	104.0511	100.1247	96.1982	92.2718	88.3453	88.3453	92.2718	96.1982	100.1247	104.0511	107.9776 (44)
Energy content (annual)	160.1276	140.0487	144.5177	125.9940	120.8942	104.3225	96.6702	110.9304	112.2553	130.8227	142.8032	155.0751 (45)
Distribution loss (46)m = 0.15 x (45)m												1544.4617 (45)

Water storage loss:	24.0191	21.0073	21.6777	18.8991	18.1341	15.6484	14.5005	16.6396	16.8383	19.6234	21.4205	23.2613 (46)
Total storage loss												
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 (56)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Total heat required for water heating calculated for each month	0.6708	0.6086	0.6503	0.5454	0.5020	0.4147	0.3843	0.4606	0.4859	0.5887	0.6206	0.6496 (61)
WWHRS	160.7984	140.6573	145.1680	126.5394	121.3962	104.7373	97.0545	111.3910	112.7412	131.4114	143.4239	155.7247 (62)
Total of WWHRS savings	-52.8094	-46.4657	-47.4242	-39.0182	-36.2287	-29.8865	-25.2932	-30.6245	-31.5182	-38.9634	-45.1348	-51.0429 eq. (G10)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-474.4098
Output from w/h								Solar input (sum of months) = Sum(63)m =				0.0000 (63)
	107.9890	94.1916	97.7438	87.5212	85.1676	74.8508	71.7613	80.7666	81.2231	92.4480	98.2890	104.6817 (64)
								Total per year (kWh/year) = Sum(64)m =				1076.6336 (64)
Heat gains from water heating, kWh/month												
	53.4101	46.7183	48.2147	42.0294	40.3228	34.7909	32.2389	36.9995	37.4464	43.6457	47.6372	51.7249 (65)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8247	0.7997	0.7441	0.6558	0.5381	0.3700	0.2397	0.2391	0.4542	0.6563	0.7766	0.8336 (94)
Useful gains	601.2993	636.4067	661.1374	644.8950	541.6148	382.8678	232.8652	222.3776	388.0015	500.6513	549.2295	575.8906 (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	1243.0611	1222.6325	1118.7064	938.9623	686.9904	426.7493	243.8220	232.7403	457.4527	729.9865	993.7207	1214.9203 (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	477.4707	393.9437	340.4313	211.7285	108.1594	0.0000	0.0000	0.0000	0.0000	170.6253	320.0337	475.4381 (98)
Space heating												2497.8307 (98)
Space heating per m2												26.1717 (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

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													2769.2137 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	477.4707	393.9437	340.4313	211.7285	108.1594	0.0000	0.0000	0.0000	0.0000	170.6253	320.0337	475.4381	(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)	529.3467	436.7447	377.4183	234.7322	119.9106	0.0000	0.0000	0.0000	0.0000	189.1634	354.8045	527.0932	(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	107.9890	94.1916	97.7438	87.5212	85.1676	74.8508	71.7613	80.7666	81.2231	92.4480	98.2890	104.6817	(64)
Efficiency of water heater (217)m	87.2917	87.1620	86.7064	85.6740	83.5515	76.4000	76.4000	76.4000	76.4000	84.8162	86.5277	76.4000	(216)
Fuel for water heating, kWh/month	123.7105	108.0650	112.7297	102.1561	101.9342	97.9723	93.9284	105.7154	106.3129	108.9980	113.5925	119.8378	(219)
Water heating fuel used												1294.9526	(219)
Annual totals kWh/year													
Space heating fuel - main system												2769.2137	(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)													430.9551 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 2.50 * 1217 * 0.80) =									-1946.4459			-1946.4459	(233)
Total delivered energy for all uses												2623.6755	(238)

10a. Fuel costs - using BEDF prices (540)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2769.2137	7.6100	210.7372 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1294.9526	7.6100	98.5459 (247)
Pumps and fans for heating	75.0000	31.0800	23.3100 (249)
Energy for lighting	430.9551	31.0800	133.9408 (250)
Additional standing charges			105.0000 (251)
Energy saving/generation technologies			
PV Unit	-1946.4459	31.0800	-604.9554 (252)
Total energy cost			-33.4215 (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	2769.2137	0.2160	598.1502 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1294.9526	0.2160	279.7098 (264)
Space and water heating			877.8599 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	430.9551	0.5190	223.6657 (268)
Energy saving/generation technologies			
PV Unit	-1946.4459	0.5190	-1010.2054 (269)
Total kg/year			130.2452 (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	2769.2137	1.2200	3378.4407 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1294.9526	1.2200	1579.8422 (264)
Space and water heating			4958.2829 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	430.9551	3.0700	1323.0321 (268)
Energy saving/generation technologies			
PV Unit	-1946.4459	3.0700	-5975.5890 (269)
Primary energy kWh/year			535.9760 (272)
Primary energy kWh/m2/year			5.6158 (273)

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Built)

Property Reference	041 - PRJ013014	Issued on Date	02/05/2024
Assessment Reference	041	Prop Type Ref	C
Property	25 Deeble way, Netley Abbey, Southampton, SO31 5JP		
SAP Rating	85 B	DER	14.31
Environmental	88 B	TER	17.29
CO ₂ Emissions (t/year)	1.14	% DER<TER	17.22
General Requirements Compliance	Pass	DfEE	44.01
		TfEE	49.67
		% DfEE<TfEE	11.39
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)	17.29	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.31	kgCO ₂ /m ²	Pass
	-2.98 (-17.2%)	kgCO ₂ /m ²	

1b TfEE and DfEE

Target Fabric Energy Efficiency (TfEE)	49.67	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DfEE)	44.01	kWh/m ² /yr	
	-5.7 (-11.5%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (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)	0.08 (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	4.48 (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 East

7.24 m², No overhang

Windows facing South

0.72 m², No overhang

Windows facing West

3.61 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

4.48 (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