

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

Property Reference	018 - PRJ013014	Issued on Date	28/03/2024
Assessment Reference	018	Prop Type Ref	2B
Property	15 Deeble way, Netley Abbey, Southampton, SO31 5JP		

SAP Rating	86 B	DER	13.82	TER	17.00
Environmental	89 B	% DER<TER	18.70		
CO ₂ Emissions (t/year)	0.94	DFEE	38.93	TFEE	43.58
General Requirements Compliance	Pass	% DFEE<TFEE	10.67		

Assessor Details	Mr. Christopher Nicholls, Briary Energy Limited, Tel: 0203 397 1373, chris@briaryenergy.co.uk	Assessor ID	4299-0004
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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	40.9100 (1b)	x 2.3700 (2b)	= 96.9567 (1b) - (3b)
First floor	40.9100 (1c)	x 2.6200 (2c)	= 107.1842 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.8200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 204.1409 (5)

2. Ventilation rate

	main heating		secondary heating	other		total	m3 per hour					
Number of chimneys	0	+	0	+	0	=	0 * 40 = 0.0000 (6a)					
Number of open flues	0	+	0	+	0	=	0 * 20 = 0.0000 (6b)					
Number of intermittent fans							3 * 10 = 30.0000 (7a)					
Number of passive vents							0 * 10 = 0.0000 (7b)					
Number of flueless gas fires							0 * 40 = 0.0000 (7c)					
							Air changes per hour					
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) =	0.1470 (8)					
Pressure test						Yes						
Measured/design AP50							4.4900					
Infiltration rate							0.3715 (18)					
Number of sides sheltered							2 (19)					
Shelter factor						(20) = 1 - [0.075 x (19)] =	0.8500 (20)					
Infiltration rate adjusted to include shelter factor						(21) = (18) x (20) =	0.3157 (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	0.3868	0.3631	0.3552	0.3315	0.3315	0.3236	0.3236	0.3157	0.3157	0.3394	0.3394	0.3473 (22b)
Effective ac	0.5748	0.5659	0.5631	0.5550	0.5550	0.5524	0.5524	0.5498	0.5498	0.5576	0.5576	0.5603 (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)			9.0800	1.3258	12.0379		(27)
Fir - Ground			40.9100	0.1600	6.5456	75.6000	3092.7960 (28a)
Wl - Brick (Timber Frame)	44.1670	11.1690	32.9980	0.2100	6.9296	7.4000	244.1852 (29a)
Rf - Ins Joist	40.9120		40.9120	0.0800	3.2730	7.4000	302.7488 (30)
Total net area of external elements Aum(A, m ²)			125.9900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.2940		(33)
Party Wall			92.4080	0.0000	0.0000	7.4000	683.8192 (32)
Stud			70.7018			7.4000	523.1936 (32c)
Internal Floor			40.9120			7.4000	302.7488 (32d)
Internal Ceiling			40.9120			7.4000	302.7488 (32e)
Heat capacity Cm = Sum (A x k)							(28)...(30) + (32) + (32a)...(32e) = 5452.2404 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							66.6370 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.4340 (36)
Total fabric heat loss							(33) + (36) = 45.7280 (37)

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

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(38)m	Jan 38.7222	Feb 38.1241	Mar 37.9331	Apr 37.3853	May 37.3853	Jun 37.2112	Jul 37.2112	Aug 37.0412	Sep 37.0412	Oct 37.5637	Nov 37.5637	Dec 37.7463 (38)
Heat transfer coeff	84.4502	83.8521	83.6611	83.1134	83.1134	82.9392	82.9392	82.7692	82.7692	83.2918	83.2918	83.4743 (39)
Average = Sum(39)m / 12 =												83.3054 (39)
HLP	Jan 1.0321	Feb 1.0248	Mar 1.0225	Apr 1.0158	May 1.0158	Jun 1.0137	Jul 1.0137	Aug 1.0116	Sep 1.0116	Oct 1.0180	Nov 1.0180	Dec 1.0202 (40)
HLP (average)												1.0182 (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												2.4965 (42)
Average daily hot water use (litres/day)												93.4916 (43)
Daily hot water use	Jan 102.8407	Feb 99.1011	Mar 95.3614	Apr 91.6217	May 87.8821	Jun 84.1424	Jul 84.1424	Aug 87.8821	Sep 91.6217	Oct 95.3614	Nov 99.1011	Dec 102.8407 (44)
Energy conte	152.5098	133.3861	137.6425	120.0000	115.1429	99.3596	92.0712	105.6531	106.9149	124.5990	136.0096	147.6976 (45)
Energy content (annual)										Total = Sum(45)m =		1470.9864 (45)
Distribution loss (46)m = 0.15 x (45)m	22.8765	20.0079	20.6464	18.0000	17.2714	14.9039	13.8107	15.8480	16.0372	18.6899	20.4014	22.1546 (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	0.6702	0.5948	0.5907	0.4948	0.4554	0.3762	0.3486	0.4178	0.4408	0.5347	0.6065	0.6490 (61)
Total heat required for water heating calculated for each month	153.1800	133.9809	138.2331	120.4948	115.5983	99.7358	92.4199	106.0709	107.3557	125.1337	136.6161	148.3467 (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	153.1800	133.9809	138.2331	120.4948	115.5983	99.7358	92.4199	106.0709	107.3557	125.1337	136.6161	148.3467 (64)
RHI water heating demand										Total per year (kWh/year) = Sum(64)m =		1477.1660 (64)
Heat gains from water heating, kWh/month	50.8771	44.4996	45.9138	40.0237	38.3989	33.1311	30.7008	35.2341	35.6594	41.5629	45.3748	49.2717 (65)

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

Metabolic gains (Table 5), Watts	Jan 149.7892	Feb 149.7892	Mar 149.7892	Apr 149.7892	May 149.7892	Jun 149.7892	Jul 149.7892	Aug 149.7892	Sep 149.7892	Oct 149.7892	Nov 149.7892	Dec 149.7892 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.8308	49.5885	40.3280	30.5309	22.8222	19.2675	20.8192	27.0616	36.3220	46.1191	53.8278	57.3825 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	333.1376	336.5945	327.8832	309.3378	285.9275	263.9252	249.2263	245.7693	254.4807	273.0261	296.4364	318.4387 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754 (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)	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595 (71)
Water heating gains (Table 5)	68.3832	66.2196	61.7121	55.5885	51.6114	46.0154	41.2646	47.3577	49.5270	55.8641	63.0206	66.2254 (72)
Total internal gains	562.7568	557.8078	535.3285	500.8623	465.7663	434.6133	416.7152	425.5938	445.7348	480.4144	518.6899	547.4518 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
Southeast				2.7240	45.0642	0.7300	0.7200			0.7700			44.7123 (77)
Northwest				6.3550	14.6130	0.7300	0.7200			0.7700			33.8255 (81)
Solar gains	78.5379	123.8216	199.1239	293.4539	347.8662	399.4431	364.9442	318.4939	243.0489	157.2851	95.8917	64.7126	(83)
Total gains	641.2946	681.6294	734.4523	794.3163	813.6325	834.0564	781.6594	744.0876	688.7837	637.6995	614.5816	612.1645	(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	Jan 17.9338	Feb 18.0617	Mar 18.1029	Apr 18.2222	May 18.2222	Jun 18.2605	Jul 18.2605	Aug 18.2980	Sep 18.2980	Oct 18.1832	Nov 18.1832	Dec 18.1434
alpha	2.1956	2.2041	2.2069	2.2148	2.2148	2.2174	2.2174	2.2199	2.2199	2.2122	2.2122	2.2096
util living area	0.8789	0.8605	0.8154	0.7329	0.6125	0.4446	0.3272	0.3319	0.5396	0.7314	0.8378	0.8856 (86)
MIT	18.9029	19.0852	19.5142	20.0608	20.5411	20.8487	20.9478	20.9481	20.7571	20.2518	19.5476	18.8965 (87)
Th 2	20.0566	20.0627	20.0646	20.0702	20.0702	20.0720	20.0720	20.0737	20.0737	20.0684	20.0684	20.0665 (88)
util rest of house	0.8662	0.8460	0.7957	0.7034	0.5666	0.3782	0.2427	0.2439	0.4729	0.6937	0.8180	0.8733 (89)
MIT 2	17.2917	17.5531	18.1616	18.9250	19.5681	19.9421	20.0423	20.0451	19.8490	19.2009	18.2213	17.2884 (90)
Living area fraction									fLA = Living area / (4) =			0.1678 (91)

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MIT	17.5620	17.8102	18.3885	19.1156	19.7314	20.0942	20.1942	20.1966	20.0014	19.3773	18.4439	17.5582 (92)
Temperature adjustment												-0.1500
adjusted MIT	17.4120	17.6602	18.2385	18.9656	19.5814	19.9442	20.0442	20.0466	19.8514	19.2273	18.2939	17.4082 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8188	0.7981	0.7484	0.6627	0.5399	0.3685	0.2401	0.2412	0.4554	0.6536	0.7701	0.8269 (94)	
Useful gains	525.1049	543.9884	549.6330	526.3971	439.2462	307.3164	187.6721	179.4535	313.6559	416.8043	473.3136	506.1767 (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													
989.0834	969.3458	881.6656	736.8481	538.6916	335.4221	194.4275	185.9499	360.1626	576.9864	790.7630	968.9881 (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													
345.2000	285.8401	247.0323	151.5247	73.9874	0.0000	0.0000	0.0000	0.0000	119.1755	228.5635	344.3317 (98)		
Space heating												1795.6552 (98)	
RHI space heating demand												1796 (98)	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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	40.9100 (1b)	x 2.3700 (2b)	= 96.9567 (1b) - (3b)
First floor	40.9100 (1c)	x 2.6200 (2c)	= 107.1842 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.8200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 204.1409 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1470 (8)
Pressure test					Yes
Measured/design AP50					4.4900
Infiltration rate					0.3715 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3157 (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	0.4026	0.3947	0.3868	0.3473	0.3394	0.3000	0.3000	0.2921	0.3157	0.3394	0.3552	0.3710 (22b)
Effective ac	0.5810	0.5779	0.5748	0.5603	0.5576	0.5450	0.5450	0.5426	0.5498	0.5576	0.5631	0.5688 (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)			9.0800	1.3258	12.0379		(27)
Flr - Ground			40.9100	0.1600	6.5456	75.6000	3092.7960 (28a)
Wl - Brick (Timber Frame)	44.1670	11.1690	32.9980	0.2100	6.9296	7.4000	244.1852 (29a)
Rf - Ins Joist	40.9120		40.9120	0.0800	3.2730	7.4000	302.7488 (30)
Total net area of external elements Aum(A, m ²)			125.9900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.2940		(33)
Party Wall			92.4080	0.0000	0.0000	7.4000	683.8192 (32)
Stud			70.7018			7.4000	523.1936 (32c)
Internal Floor			40.9120			7.4000	302.7488 (32d)
Internal Ceiling			40.9120			7.4000	302.7488 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 5452.2404 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							66.6370 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.4340 (36)
Total fabric heat loss						(33) + (36) =	45.7280 (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	39.1420	38.9300	38.7222	37.7463	37.5637	36.7138	36.7138	36.5564	37.0412	37.5637	37.9331	38.3193 (38)
Heat transfer coeff	84.8700	84.6580	84.4502	83.4743	83.2918	82.4418	82.4418	82.2844	82.7692	83.2918	83.6611	84.0473 (39)
Average = Sum(39)m / 12 =												83.4735 (39)
HLP	1.0373	1.0347	1.0321	1.0202	1.0180	1.0076	1.0076	1.0057	1.0116	1.0180	1.0225	1.0272 (40)
HLP (average)												1.0202 (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												2.4965 (42)
Average daily hot water use (litres/day)												93.4916 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	102.8407	99.1011	95.3614	91.6217	87.8821	84.1424	84.1424	87.8821	91.6217	95.3614	99.1011	102.8407 (44)
Energy content (annual)	152.5098	133.3861	137.6425	120.0000	115.1429	99.3596	92.0712	105.6531	106.9149	124.5990	136.0096	147.6976 (45)
Distribution loss (46)m = 0.15 x (45)m												1470.9864 (45)

	22.8765	20.0079	20.6464	18.0000	17.2714	14.9039	13.8107	15.8480	16.0372	18.6899	20.4014	22.1546 (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	0.6702	0.5948	0.5907	0.4948	0.4554	0.3762	0.3486	0.4178	0.4408	0.5347	0.6065	0.6490 (61)
Total heat required for water heating calculated for each month	153.1800	133.9809	138.2331	120.4948	115.5983	99.7358	92.4199	106.0709	107.3557	125.1337	136.6161	148.3467 (62)
WWHRS	-49.4854	-43.5394	-44.4384	-36.5722	-33.9630	-28.0213	-23.7216	-28.7193	-29.5543	-36.5280	-42.3034	-47.8278 eq. (G10)
Total of WWHRS savings												-444.6741
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	103.6946	90.4415	93.7947	83.9226	81.6353	71.7145	68.6982	77.3516	77.8015	88.6057	94.3127	100.5189 (64)
Heat gains from water heating, kWh/month	50.8771	44.4996	45.9138	40.0237	38.3989	33.1311	30.7008	35.2341	35.6594	41.5629	45.3748	49.2717 (65)

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CALCULATION OF ENERGY RATINGS 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2459.2432 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	404.3472	331.3334	296.6453	194.1657	111.7706	0.0000	0.0000	0.0000	0.0000	176.1397	293.0758	410.7596	(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)	448.2784	367.3320	328.8751	215.2613	123.9142	0.0000	0.0000	0.0000	0.0000	195.2768	324.9178	455.3876	(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	103.6946	90.4415	93.7947	83.9226	81.6353	71.7145	68.6982	77.3516	77.8015	88.6057	94.3127	100.5189	(64)
Efficiency of water heater (217)m	86.9928	86.8366	86.4488	85.5373	83.8102	76.4000	76.4000	76.4000	76.4000	85.0580	86.4005	76.4000	(216)
Fuel for water heating, kWh/month	119.1990	104.1513	108.4974	98.1123	97.4050	93.8672	89.9191	101.2456	101.8344	104.1709	109.1576	115.3975	(219)
Water heating fuel used												1242.9574	(219)
Annual totals kWh/year													
Space heating fuel - main system												2459.2432	(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)												394.3960	(232)
Total delivered energy for all uses												4171.5967	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2459.2432	3.4800	85.5817 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1242.9574	3.4800	43.2549 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	394.3960	13.1900	52.0208 (250)
Additional standing charges			120.0000 (251)
Total energy cost			310.7499 (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] =	1.0291 (257)
SAP value		85.6436
SAP rating (Section 12)		86 (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	2459.2432	0.2160	531.1965 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1242.9574	0.2160	268.4788 (264)
Space and water heating			799.6753 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	394.3960	0.5190	204.6915 (268)
Total kg/year			1043.2919 (272)
CO2 emissions per m2			12.7500 (273)
EI value			88.9764
EI rating			89 (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	$3.48 / 0.8282 = 4.202$, stars = 5
Water heating environmental impact	$0.216 / 0.8282 = 0.2608$, 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	40.9100 (1b)	x 2.3700 (2b)	= 96.9567 (1b) - (3b)
First floor	40.9100 (1c)	x 2.6200 (2c)	= 107.1842 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.8200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 204.1409 (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) = 0.1470 (8)
Pressure test					Yes
Measured/design AP50					4.4900
Infiltration rate					0.3715 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3157 (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	0.3868	0.3631	0.3552	0.3315	0.3315	0.3236	0.3236	0.3157	0.3157	0.3394	0.3394	0.3473 (22b)
Effective ac	0.5748	0.5659	0.5631	0.5550	0.5550	0.5524	0.5524	0.5498	0.5498	0.5576	0.5576	0.5603 (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)			9.0800	1.3258	12.0379		(27)
Flr - Ground			40.9100	0.1600	6.5456	75.6000	3092.7960 (28a)
Wl - Brick (Timber Frame)	44.1670	11.1690	32.9980	0.2100	6.9296	7.4000	244.1852 (29a)
Rf - Ins Joist	40.9120		40.9120	0.0800	3.2730	7.4000	302.7488 (30)
Total net area of external elements Aum(A, m ²)			125.9900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.2940		(33)
Party Wall			92.4080	0.0000	0.0000	7.4000	683.8192 (32)
Stud			70.7018			7.4000	523.1936 (32c)
Internal Floor			40.9120			7.4000	302.7488 (32d)
Internal Ceiling			40.9120			7.4000	302.7488 (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
(28)...(30) + (32) + (32a)...(32e) = 5452.2404 (34)
66.6370 (35)
14.4340 (36)
(33) + (36) = 45.7280 (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	38.7222	38.1241	37.9331	37.3853	37.3853	37.2112	37.2112	37.0412	37.0412	37.5637	37.5637	37.7463 (38)
Heat transfer coeff	84.4502	83.8521	83.6611	83.1134	83.1134	82.9392	82.9392	82.7692	82.7692	83.2918	83.2918	83.4743 (39)
Average = Sum(39)m / 12 =												83.3054 (39)
HLP	1.0321	1.0248	1.0225	1.0158	1.0158	1.0137	1.0137	1.0116	1.0116	1.0180	1.0180	1.0202 (40)
HLP (average)												1.0182 (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												2.4965 (42)
Average daily hot water use (litres/day)												93.4916 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	102.8407	99.1011	95.3614	91.6217	87.8821	84.1424	84.1424	87.8821	91.6217	95.3614	99.1011	102.8407 (44)
Energy content (annual)	152.5098	133.3861	137.6425	120.0000	115.1429	99.3596	92.0712	105.6531	106.9149	124.5990	136.0096	147.6976 (45)
Distribution loss (46)m = 0.15 x (45)m												1470.9864 (45)

	22.8765	20.0079	20.6464	18.0000	17.2714	14.9039	13.8107	15.8480	16.0372	18.6899	20.4014	22.1546 (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	0.6702	0.5948	0.5907	0.4948	0.4554	0.3762	0.3486	0.4178	0.4408	0.5347	0.6065	0.6490 (61)
Total heat required for water heating calculated for each month	153.1800	133.9809	138.2331	120.4948	115.5983	99.7358	92.4199	106.0709	107.3557	125.1337	136.6161	148.3467 (62)
WWHRS	-49.4854	-43.5394	-44.4384	-36.5722	-33.9630	-28.0213	-23.7216	-28.7193	-29.5543	-36.5280	-42.3034	-47.8278 eq. (G10)
Total of WWHRS savings												-444.6741
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	103.6946	90.4415	93.7947	83.9226	81.6353	71.7145	68.6982	77.3516	77.8015	88.6057	94.3127	100.5189 (64)
Heat gains from water heating, kWh/month	50.8771	44.4996	45.9138	40.0237	38.3989	33.1311	30.7008	35.2341	35.6594	41.5629	45.3748	49.2717 (65)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1990.7486 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	345.2000	285.8401	247.0323	151.5247	73.9874	0.0000	0.0000	0.0000	0.0000	119.1755	228.5635	344.3317	(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)	382.7051	316.8959	273.8717	167.9875	82.0259	0.0000	0.0000	0.0000	0.0000	132.1236	253.3964	381.7424	(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	103.6946	90.4415	93.7947	83.9226	81.6353	71.7145	68.6982	77.3516	77.8015	88.6057	94.3127	100.5189	(64)
Efficiency of water heater (217)m	86.5871	86.4469	85.9286	84.7439	82.3931	76.4000	76.4000	76.4000	76.4000	83.7491	85.6794	76.4000	(216)
Fuel for water heating, kWh/month	119.7575	104.6208	109.1542	99.0308	99.0803	93.8672	89.9191	101.2456	101.8344	105.7990	110.0763	115.9884	(219)
Water heating fuel used												1250.3738	(219)
Annual totals kWh/year													
Space heating fuel - main system												1990.7486	(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)												394.3960	(232)
Total delivered energy for all uses												3710.5183	(238)

10a. Fuel costs - using BEDF prices (538)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1990.7486	7.6100	151.4960 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1250.3738	7.6100	95.1534 (247)
Pumps and fans for heating	75.0000	31.0800	23.3100 (249)
Energy for lighting	394.3960	31.0800	122.5783 (250)
Additional standing charges			105.0000 (251)
Total energy cost			497.5377 (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	1990.7486	0.2160	430.0017 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1250.3738	0.2160	270.0807 (264)
Space and water heating			700.0824 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	394.3960	0.5190	204.6915 (268)
Total kg/year			943.6990 (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	1990.7486	1.2200	2428.7132 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1250.3738	1.2200	1525.4560 (264)
Space and water heating			3954.1693 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	394.3960	3.0700	1210.7958 (268)
Primary energy kWh/year			5395.2150 (272)
Primary energy kWh/m2/year			65.9401 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 86
Current environmental impact rating: B 89

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	+ 10.5	-£ 605	-1010 kg (107.0%)

Measures omitted - SAP change or cost saving too small:

N Solar water heating	+ 0.9	-£ 44	-144 kg (15.2%)
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Recommended measures	Typical annual savings		Energy efficiency	Environmental impact
Solar photovoltaic panels	£605	12.35 kg/m²	A 96	A 98
Total Savings	£605	12.35 kg/m²		
Potential energy efficiency rating:			A 96	
Potential environmental impact rating:				A 98

Fuel prices for cost data on this page from database revision number 538 TEST (29 Feb 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	£146	£146	£0
Mains gas	£352	£352	£0
Space heating	£280	£280	£0
Water heating	£95	£95	£0
Lighting	£123	£123	£0
Generated (PV)	-£0	-£605	£605
Total cost of fuels	£498	-£107	£605
Total cost of uses	£498	-£107	£605
Delivered energy	45 kWh/m²	22 kWh/m²	24 kWh/m²
Carbon dioxide emissions	0.9 tonnes	-0.1 tonnes	1.0 tonnes
CO2 emissions per m²	12 kg/m²	-1 kg/m²	12 kg/m²
Primary energy	66 kWh/m²	-7 kWh/m²	73 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	40.9100 (1b)	x 2.3700 (2b)	= 96.9567 (1b) - (3b)
First floor	40.9100 (1c)	x 2.6200 (2c)	= 107.1842 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.8200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 204.1409 (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) = 0.1470 (8)
Pressure test					Yes
Measured/design AP50					4.4900
Infiltration rate					0.3715 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3157 (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	0.4026	0.3947	0.3868	0.3473	0.3394	0.3000	0.3000	0.2921	0.3157	0.3394	0.3552	0.3710 (22b)
Effective ac	0.5810	0.5779	0.5748	0.5603	0.5576	0.5450	0.5450	0.5426	0.5498	0.5576	0.5631	0.5688 (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)			9.0800	1.3258	12.0379		(27)
Flr - Ground			40.9100	0.1600	6.5456	75.6000	3092.7960 (28a)
Wl - Brick (Timber Frame)	44.1670	11.1690	32.9980	0.2100	6.9296	7.4000	244.1852 (29a)
Rf - Ins Joist	40.9120		40.9120	0.0800	3.2730	7.4000	302.7488 (30)
Total net area of external elements Aum(A, m ²)			125.9900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.2940		(33)
Party Wall			92.4080	0.0000	0.0000	7.4000	683.8192 (32)
Stud			70.7018			7.4000	523.1936 (32c)
Internal Floor			40.9120			7.4000	302.7488 (32d)
Internal Ceiling			40.9120			7.4000	302.7488 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 5452.2404 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							66.6370 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.4340 (36)
Total fabric heat loss							(33) + (36) = 45.7280 (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	39.1420	38.9300	38.7222	37.7463	37.5637	36.7138	36.7138	36.5564	37.0412	37.5637	37.9331	38.3193 (38)
Heat transfer coeff	84.8700	84.6580	84.4502	83.4743	83.2918	82.4418	82.4418	82.2844	82.7692	83.2918	83.6611	84.0473 (39)
Average = Sum(39)m / 12 =												83.4735 (39)
HLP	1.0373	1.0347	1.0321	1.0202	1.0180	1.0076	1.0076	1.0057	1.0116	1.0180	1.0225	1.0272 (40)
HLP (average)												1.0202 (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												2.4965 (42)
Average daily hot water use (litres/day)												93.4916 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	102.8407	99.1011	95.3614	91.6217	87.8821	84.1424	84.1424	87.8821	91.6217	95.3614	99.1011	102.8407 (44)
Energy content (annual)	152.5098	133.3861	137.6425	120.0000	115.1429	99.3596	92.0712	105.6531	106.9149	124.5990	136.0096	147.6976 (45)
Distribution loss (46)m = 0.15 x (45)m												1470.9864 (45)

	22.8765	20.0079	20.6464	18.0000	17.2714	14.9039	13.8107	15.8480	16.0372	18.6899	20.4014	22.1546 (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	0.6702	0.5948	0.5907	0.4948	0.4554	0.3762	0.3486	0.4178	0.4408	0.5347	0.6065	0.6490 (61)
Total heat required for water heating calculated for each month	153.1800	133.9809	138.2331	120.4948	115.5983	99.7358	92.4199	106.0709	107.3557	125.1337	136.6161	148.3467 (62)
WWHRS	-49.4854	-43.5394	-44.4384	-36.5722	-33.9630	-28.0213	-23.7216	-28.7193	-29.5543	-36.5280	-42.3034	-47.8278 eq. (G10)
Total of WWHRS savings												-444.6741
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	103.6946	90.4415	93.7947	83.9226	81.6353	71.7145	68.6982	77.3516	77.8015	88.6057	94.3127	100.5189 (64)
Heat gains from water heating, kWh/month	50.8771	44.4996	45.9138	40.0237	38.3989	33.1311	30.7008	35.2341	35.6594	41.5629	45.3748	49.2717 (65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.8308	49.5885	40.3280	30.5309	22.8222	19.2675	20.8192	27.0616	36.3220	46.1191	53.8278	57.3825 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	333.1376	336.5945	327.8832	309.3378	285.9275	263.9252	249.2263	245.7693	254.4807	273.0261	296.4364	318.4387 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754 (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)	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595 (71)
Water heating gains (Table 5)	68.3832	66.2196	61.7121	55.5885	51.6114	46.0154	41.2646	47.3577	49.5270	55.8641	63.0206	66.2254 (72)
Total internal gains	562.7568	557.8078	535.3285	500.8623	465.7663	434.6133	416.7152	425.5938	445.7348	480.4144	518.6899	547.4518 (73)

[Jan					Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d	Gains W	

Southeast					2.7240	36.7938	0.7300	0.7200		0.7700	36.5065 (77)	
Northwest					6.3550	11.2829	0.7300	0.7200		0.7700	26.1172 (81)	

Solar gains	62.6237	115.3465	180.8646	262.7229	329.5247	342.6484	323.8964	271.6886	208.8383	133.6953	76.5886	52.5706 (83)
Total gains	625.3805	673.1542	716.1931	763.5852	795.2909	777.2616	740.6116	697.2824	654.5731	614.1097	595.2785	600.0224 (84)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, n11,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	17.8451	17.8898	17.9338	18.1434	18.1832	18.3707	18.3707	18.4058	18.2980	18.1832	18.1029	18.0198
alpha	2.1897	2.1927	2.1956	2.2096	2.2122	2.2247	2.2247	2.2271	2.2199	2.2122	2.2069	2.2013
util living area	0.8995	0.8796	0.8440	0.7780	0.6796	0.5497	0.4330	0.4689	0.6413	0.7967	0.8739	0.9066 (86)
MIT	18.5448	18.7832	19.2150	19.7960	20.3215	20.7078	20.8776	20.8497	20.5602	19.9076	19.1417	18.4954 (87)
Th 2	20.0524	20.0545	20.0566	20.0665	20.0684	20.0770	20.0770	20.0786	20.0737	20.0684	20.0646	20.0607 (88)
util rest of house	0.8894	0.8675	0.8279	0.7539	0.6422	0.4929	0.3569	0.3930	0.5887	0.7696	0.8594	0.8971 (89)
MIT 2	16.7748	17.1164	17.7336	18.5574	19.2790	19.7857	19.9820	19.9565	19.6099	18.7290	17.6415	16.7078 (90)
Living area fraction												0.1678 (91)
MIT	17.0718	17.3961	17.9822	18.7652	19.4539	19.9404	20.1323	20.1064	19.7694	18.9268	17.8932	17.0078 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.9218	17.2461	17.8322	18.6152	19.3039	19.7904	19.9823	19.9564	19.6194	18.7768	17.7432	16.8578 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8439	0.8202	0.7795	0.7089	0.6075	0.4737	0.3486	0.3822	0.5596	0.7235	0.8120	0.8529 (94)
Useful gains	527.7340	552.1408	558.2915	541.2990	483.1135	368.2238	258.1673	266.4881	366.2850	444.3125	483.3762	511.7539 (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	1071.2113	1045.1965	957.0084	810.9735	633.3428	427.9092	278.8408	292.6336	456.8343	681.0594	890.4259	1063.8502 (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	404.3472	331.3334	296.6453	194.1657	111.7706	0.0000	0.0000	0.0000	0.0000	176.1397	293.0758	410.7596 (98)
Space heating												2218.2374 (98)
Space heating per m2												27.1112 (99)
										(98) / (4) =		

Regs Region: England
Elmhurst Energy Systems
SAP2012 Calculator (Design
System) version 4.14r19

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												90.2000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												2459.2432	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	404.3472	331.3334	296.6453	194.1657	111.7706	0.0000	0.0000	0.0000	0.0000	176.1397	293.0758	410.7596	(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)	448.2784	367.3320	328.8751	215.2613	123.9142	0.0000	0.0000	0.0000	0.0000	195.2768	324.9178	455.3876	(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	103.6946	90.4415	93.7947	83.9226	81.6353	71.7145	68.6982	77.3516	77.8015	88.6057	94.3127	100.5189	(64)
Efficiency of water heater (217)m	86.9928	86.8366	86.4488	85.5373	83.8102	76.4000	76.4000	76.4000	76.4000	85.0580	86.4005	76.4000	(216)
Fuel for water heating, kWh/month	119.1990	104.1513	108.4974	98.1123	97.4050	93.8672	89.9191	101.2456	101.8344	104.1709	109.1576	115.3975	(219)
Water heating fuel used												1242.9574	(219)
Annual totals kWh/year													
Space heating fuel - main system												2459.2432	(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)												394.3960	(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												2444.3573	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2459.2432	3.4800	85.5817 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1242.9574	3.4800	43.2549 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	394.3960	13.1900	52.0208 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-1727.2394	13.1900	-227.8229 (252)
Total energy cost			82.9270 (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] = 0.2746 (257)
SAP value	96.1688
SAP rating (Section 12)	96 (258)
SAP band	A

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2459.2432	0.2160	531.1965 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1242.9574	0.2160	268.4788 (264)
Space and water heating			799.6753 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	394.3960	0.5190	204.6915 (268)
Energy saving/generation technologies			
PV Unit	-1727.2394	0.5190	-896.4372 (269)
Total kg/year			146.8546 (272)
CO2 emissions per m2			1.7900 (273)
EI value			98.4483
EI rating			98 (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	40.9100 (1b)	x 2.3700 (2b)	= 96.9567 (1b) - (3b)
First floor	40.9100 (1c)	x 2.6200 (2c)	= 107.1842 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.8200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 204.1409 (5)

2. Ventilation rate

										main heating	secondary heating	other	total	m3 per hour			
Number of chimneys										0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues										0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans																3 * 10 =	30.0000 (7a)
Number of passive vents																0 * 10 =	0.0000 (7b)
Number of flueless gas fires																0 * 40 =	0.0000 (7c)
										Air changes per hour							
Infiltration due to chimneys, flues and fans										= (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000	/ (5) =	0.1470 (8)
Pressure test										Yes							
Measured/design AP50										4.4900							
Infiltration rate										0.3715 (18)							
Number of sides sheltered										2 (19)							
Shelter factor										(20) = 1 - [0.075 x (19)] =					0.8500 (20)		
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =					0.3157 (21)		
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec					
	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	0.3868	0.3631	0.3552	0.3315	0.3315	0.3236	0.3236	0.3157	0.3157	0.3394	0.3394	0.3473	(22b)				
Effective ac	0.5748	0.5659	0.5631	0.5550	0.5550	0.5524	0.5524	0.5498	0.5498	0.5576	0.5576	0.5603	(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)			9.0800	1.3258	12.0379		(27)
Flr - Ground			40.9100	0.1600	6.5456	75.6000	3092.7960 (28a)
Wl - Brick (Timber Frame)	44.1670	11.1690	32.9980	0.2100	6.9296	7.4000	244.1852 (29a)
Rf - Ins Joist	40.9120		40.9120	0.0800	3.2730	7.4000	302.7488 (30)
Total net area of external elements Aum(A, m ²)			125.9900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.2940		(33)
Party Wall			92.4080	0.0000	0.0000	7.4000	683.8192 (32)
Stud			70.7018			7.4000	523.1936 (32c)
Internal Floor			40.9120			7.4000	302.7488 (32d)
Internal Ceiling			40.9120			7.4000	302.7488 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 5452.2404 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							66.6370 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.4340 (36)
Total fabric heat loss							(33) + (36) = 45.7280 (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	38.7222	38.1241	37.9331	37.3853	37.3853	37.2112	37.2112	37.0412	37.0412	37.5637	37.5637	37.7463 (38)
Heat transfer coeff	84.4502	83.8521	83.6611	83.1134	83.1134	82.9392	82.9392	82.7692	82.7692	83.2918	83.2918	83.4743 (39)
Average = Sum(39)m / 12 =												83.3054 (39)
HLP	1.0321	1.0248	1.0225	1.0158	1.0158	1.0137	1.0137	1.0116	1.0116	1.0180	1.0180	1.0202 (40)
HLP (average)												1.0182 (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												2.4965 (42)
Average daily hot water use (litres/day)												93.4916 (43)
Daily hot water use	Jan 102.8407	Feb 99.1011	Mar 95.3614	Apr 91.6217	May 87.8821	Jun 84.1424	Jul 84.1424	Aug 87.8821	Sep 91.6217	Oct 95.3614	Nov 99.1011	Dec 102.8407 (44)
Energy conte	152.5098	133.3861	137.6425	120.0000	115.1429	99.3596	92.0712	105.6531	106.9149	124.5990	136.0096	147.6976 (45)
Energy content (annual)												Total = Sum(45)m = 1470.9864 (45)
Distribution loss (46)m = 0.15 x (45)m												

	22.8765	20.0079	20.6464	18.0000	17.2714	14.9039	13.8107	15.8480	16.0372	18.6899	20.4014	22.1546 (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	0.6702	0.5948	0.5907	0.4948	0.4554	0.3762	0.3486	0.4178	0.4408	0.5347	0.6065	0.6490 (61)
Total heat required for water heating calculated for each month	153.1800	133.9809	138.2331	120.4948	115.5983	99.7358	92.4199	106.0709	107.3557	125.1337	136.6161	148.3467 (62)
WWHRS	-49.4854	-43.5394	-44.4384	-36.5722	-33.9630	-28.0213	-23.7216	-28.7193	-29.5543	-36.5280	-42.3034	-47.8278 eq. (G10)
Total of WWHRS savings												-444.6741
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	103.6946	90.4415	93.7947	83.9226	81.6353	71.7145	68.6982	77.3516	77.8015	88.6057	94.3127	100.5189 (64)
Heat gains from water heating, kWh/month	50.8771	44.4996	45.9138	40.0237	38.3989	33.1311	30.7008	35.2341	35.6594	41.5629	45.3748	49.2717 (65)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1990.7486 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	345.2000	285.8401	247.0323	151.5247	73.9874	0.0000	0.0000	0.0000	0.0000	119.1755	228.5635	344.3317	(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)	382.7051	316.8959	273.8717	167.9875	82.0259	0.0000	0.0000	0.0000	0.0000	132.1236	253.3964	381.7424	(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	103.6946	90.4415	93.7947	83.9226	81.6353	71.7145	68.6982	77.3516	77.8015	88.6057	94.3127	100.5189	(64)
Efficiency of water heater (217)m	86.5871	86.4469	85.9286	84.7439	82.3931	76.4000	76.4000	76.4000	76.4000	83.7491	85.6794	86.6629	(216)
Fuel for water heating, kWh/month	119.7575	104.6208	109.1542	99.0308	99.0803	93.8672	89.9191	101.2456	101.8344	105.7990	110.0763	115.9884	(219)
Water heating fuel used												1250.3738	(219)
Annual totals kWh/year													
Space heating fuel - main system												1990.7486	(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)												394.3960	(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												1764.0724	(238)

10a. Fuel costs - using BEDF prices (538)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1990.7486	7.6100	151.4960 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1250.3738	7.6100	95.1534 (247)
Pumps and fans for heating	75.0000	31.0800	23.3100 (249)
Energy for lighting	394.3960	31.0800	122.5783 (250)
Additional standing charges			105.0000 (251)
Energy saving/generation technologies			
PV Unit	-1946.4459	31.0800	-604.9554 (252)
Total energy cost			-107.4177 (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	1990.7486	0.2160	430.0017 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1250.3738	0.2160	270.0807 (264)
Space and water heating			700.0824 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	394.3960	0.5190	204.6915 (268)
Energy saving/generation technologies			
PV Unit	-1946.4459	0.5190	-1010.2054 (269)
Total kg/year			-66.5065 (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	1990.7486	1.2200	2428.7132 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1250.3738	1.2200	1525.4560 (264)
Space and water heating			3954.1693 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	394.3960	3.0700	1210.7958 (268)
Energy saving/generation technologies			
PV Unit	-1946.4459	3.0700	-5975.5890 (269)
Primary energy kWh/year			-580.3740 (272)
Primary energy kWh/m2/year			-7.0933 (273)

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Built)

Property Reference	018 - PRJ013014	Issued on Date	28/03/2024
Assessment Reference	018	Prop Type Ref	2B
Property	15 Deeble way, Netley Abbey, Southampton, SO31 5JP		
SAP Rating	86 B	DER	13.82
Environmental	89 B	TER	17.00
CO ₂ Emissions (t/year)	0.94	% DER<TER	18.70
General Requirements Compliance	Pass	DfEE	38.93
		TfEE	43.58
		% DfEE<TfEE	10.67
Assessor Details	Mr. Christopher Nicholls, Briary Energy Limited, Tel: 0203 397 1373, chris@briaryenergy.co.uk		Assessor ID
			4299-0004
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)	17.00	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	13.82	kgCO ₂ /m ²	Pass
	-3.18 (-18.7%)	kgCO ₂ /m ²	

1b TfEE and DfEE

Target Fabric Energy Efficiency (TfEE)	43.58	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DfEE)	38.93	kWh/m ² /yr	
	-4.7 (-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	0.16 (max. 0.25)	0.16 (max. 0.70)	Pass
Roof	0.08 (max. 0.20)	0.08 (max. 0.35)	Pass
Openings	1.36 (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	4.49 (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 South East

2.72 m², No overhang

Windows facing North West

6.36 m², No overhang

Air change rate

4.66 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

4.49 (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

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