

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

Property Reference	047 - PRJ013014	Issued on Date	09/05/2024
Assessment Reference	047	Prop Type Ref	3B
Property	3 Rashleigh Drive, Netley Abbey, Southampton, SO31 5JY		

SAP Rating	85 B	DER	14.40	TER	17.61
Environmental	88 B	% DER<TER	18.24		
CO ₂ Emissions (t/year)	1.13	DFEE	44.38	TTEE	50.66
General Requirements Compliance	Pass	% DFEE<TFEE	12.38		

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	47.1500 (1b)	x 2.3700 (2b)	= 111.7455 (1b) - (3b)
First floor	47.1500 (1c)	x 2.6200 (2c)	= 123.5330 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 235.2785 (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) =	0.1275 (8)			
Pressure test								Yes				
Measured/design AP50								4.4900				
Infiltration rate								0.3520 (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) =	0.3256 (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	0.3989	0.3744	0.3663	0.3419	0.3419	0.3337	0.3337	0.3256	0.3256	0.3500	0.3500	0.3582 (22b)
Effective ac	0.5795	0.5701	0.5671	0.5584	0.5584	0.5557	0.5557	0.5530	0.5530	0.5613	0.5613	0.5641 (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)			11.2600	1.3258	14.9413		(27)
Floor - Ground			47.1480	0.1800	8.4866	75.6000	3564.3888 (28a)
W1 - Brick (Timber Frame)	97.1030	13.3520	83.7510	0.2100	17.5877	7.4000	619.7574 (29a)
Rf - Ins Joist	47.1480		47.1480	0.0800	3.7718	7.4000	348.8952 (30)
Total net area of external elements Aum(A, m ²)			191.4070				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	47.2955		(33)
Party Wall			46.2040	0.0000	0.0000	7.4000	341.9096 (32)
Stud			76.8070			7.4000	568.3715 (32c)
Internal Floor			47.1480			7.4000	348.8952 (32d)
Internal Ceiling			47.1480			7.4000	348.8952 (32e)
Heat capacity Cm = Sum (A x k)							(28)...(30) + (32) + (32a)...(32e) = 6141.1129 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							65.1231 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							16.6315 (36)
Total fabric heat loss							(33) + (36) = 63.9270 (37)

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

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(38)m	Jan 44.9972	Feb 44.2641	Mar 44.0300	Apr 43.3586	May 43.3586	Jun 43.1451	Jul 43.1451	Aug 42.9368	Sep 42.9368	Oct 43.5773	Nov 43.5773	Dec 43.8011	(38)
Heat transfer coeff	108.9242	108.1911	107.9570	107.2856	107.2856	107.0721	107.0721	106.8637	106.8637	107.5043	107.5043	107.7281	(39)
Average = Sum(39)m / 12 =												107.5210	(39)
HLP	Jan 1.1551	Feb 1.1473	Mar 1.1448	Apr 1.1377	May 1.1377	Jun 1.1354	Jul 1.1354	Aug 1.1332	Sep 1.1332	Oct 1.1400	Nov 1.1400	Dec 1.1424	(40)
HLP (average)												1.1402	(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													2.6801	(42)	
Average daily hot water use (litres/day)													97.8530	(43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Daily hot water use															
	107.6383	103.7242	99.8100	95.8959	91.9818	88.0677	88.0677	91.9818	95.8959	99.8100	103.7242	107.6383	(44)		
Energy conte	159.6245	139.6086	144.0635	125.5981	120.5144	103.9947	96.3664	110.5819	111.9025	130.4116	142.3545	154.5878	(45)		
Energy content (annual)										Total = Sum(45)m =		1539.6084	(45)		
Distribution loss (46)m = 0.15 x (45)m															
	23.9437	20.9413	21.6095	18.8397	18.0772	15.5992	14.4550	16.5873	16.7854	19.5617	21.3532	23.1882	(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	0.6471	0.5420	0.4988	0.4121	0.3819	0.4577	0.4829	0.5857	0.6205	0.6497	(61)		
Total heat required for water heating calculated for each month															
	160.2953	140.2171	144.7106	126.1401	121.0132	104.4069	96.7483	111.0396	112.3854	130.9974	142.9750	155.2374	(62)		
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)		
								Solar input (sum of months) = Sum(63)m =						0.0000	(63)
Output from w/h															
	160.2953	140.2171	144.7106	126.1401	121.0132	104.4069	96.7483	111.0396	112.3854	130.9974	142.9750	155.2374	(64)		
								Total per year (kWh/year) = Sum(64)m =					1546.1663	(64)	
RHI water heating demand													1546	(64)	
Heat gains from water heating, kWh/month															
	53.2428	46.5720	48.0629	41.8969	40.1957	34.6813	32.1373	36.8829	37.3283	43.5083	47.4880	51.5628	(65)		

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

Metabolic gains (Table 5), Watts	Jan 160.8075	Feb 160.8075	Mar 160.8075	Apr 160.8075	May 160.8075	Jun 160.8075	Jul 160.8075	Aug 160.8075	Sep 160.8075	Oct 160.8075	Nov 160.8075	Dec 160.8075	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	60.7305	53.9403	43.8672	33.2103	24.8251	20.9584	22.6463	29.4365	39.5096	50.1665	58.5517	62.4184	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	368.3136	372.1356	362.5044	342.0008	316.1186	291.7931	275.5421	271.7202	281.3513	301.8550	327.7371	352.0627	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.7609	53.7609	53.7609	53.7609	53.7609	53.7609	53.7609	53.7609	53.7609	53.7609	53.7609	53.7609	(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)	-107.2050	-107.2050	-107.2050	-107.2050	-107.2050	-107.2050	-107.2050	-107.2050	-107.2050	-107.2050	-107.2050	-107.2050	(71)
Water heating gains (Table 5)	71.5630	69.3036	64.6007	58.1901	54.0265	48.1684	43.1953	49.5738	51.8449	58.4789	65.9556	69.3049	(72)
Total internal gains	610.9705	605.7429	581.3357	543.7646	505.3336	471.2833	451.7471	461.0938	483.0692	520.8637	562.6078	594.1494	(73)

6. Solar gains

[Jan]													Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North													7.7170	13.4684	0.7300	0.7200	0.7700	37.8576
South													3.5460	56.5862	0.7300	0.7200	0.7700	73.0866
Solar gains	110.9443	163.8369	240.5391	328.3741	375.0389	425.8368	390.8111	349.8360	283.6464	200.9973	132.9688			93.0712	(83)			
Total gains	721.9148	769.5797	821.8748	872.1387	880.3726	897.1200	842.5581	810.9298	766.7156	721.8610	695.5766			687.2205	(84)			

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	15.6610	15.7671	15.8013	15.9002	15.9002	15.9319	15.9319	15.9630	15.9630	15.8679	15.8679	15.8349	
alpha	2.0441	2.0511	2.0534	2.0600	2.0600	2.0621	2.0621	2.0642	2.0642	2.0579	2.0579	2.0557	
util living area	0.8888	0.8719	0.8337	0.7655	0.6603	0.4992	0.3757	0.3775	0.5810	0.7552	0.8513	0.8952	(86)
MIT	18.5483	18.7412	19.1964	19.7904	20.3583	20.7629	20.9113	20.9135	20.6564	20.0606	19.2676	18.5409	(87)
Th 2	19.9561	19.9624	19.9644	19.9702	19.9702	19.9720	19.9720	19.9738	19.9738	19.9683	19.9683	19.9664	(88)
util rest of house	0.8762	0.8575	0.8142	0.7359	0.6119	0.4226	0.2725	0.2706	0.5078	0.7165	0.8314	0.8832	(89)
MIT 2	16.7578	17.0325	17.6772	18.5081	19.2748	19.7725	19.9241	19.9287	19.6620	18.8929	17.7896	16.7520	(90)
Living area fraction									fLA = Living area / (4) =			0.1592	(91)

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MIT	17.0428	17.3045	17.9190	18.7122	19.4472	19.9302	20.0812	20.0855	19.8203	19.0787	18.0248	17.0368 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.8928	17.1545	17.7690	18.5622	19.2972	19.7802	19.9312	19.9355	19.6703	18.9287	17.8748	16.8868 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8247	0.8048	0.7608	0.6866	0.5754	0.4070	0.2681	0.2663	0.4832	0.6686	0.7780	0.8328	(94)
Useful gains	595.3561	619.3814	625.2462	598.8293	506.5367	365.0838	225.9026	215.9818	370.5099	482.6556	541.1818	572.3137	(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													
	1219.1680	1195.9945	1087.0196	907.8741	664.8725	415.4565	238.9009	228.2039	445.6500	712.6160	975.5830	1194.3570	(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													
	464.1160	387.4840	343.5593	222.5123	117.8018	0.0000	0.0000	0.0000	0.0000	171.0906	312.7689	462.8002	(98)
Space heating													
RHI space heating demand												2482.1331	(98)
												2482	(98)

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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	47.1500 (1b)	x 2.3700 (2b)	= 111.7455 (1b) - (3b)
First floor	47.1500 (1c)	x 2.6200 (2c)	= 123.5330 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 235.2785 (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) = 0.1275 (8)
Pressure test					Yes
Measured/design AP50					4.4900
Infiltration rate					0.3520 (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) =	0.3256 (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	0.4151	0.4070	0.3989	0.3582	0.3500	0.3093	0.3093	0.3012	0.3256	0.3500	0.3663	0.3826 (22b)
Effective ac	0.5862	0.5828	0.5795	0.5641	0.5613	0.5478	0.5478	0.5454	0.5530	0.5613	0.5671	0.5732 (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)			11.2600	1.3258	14.9413		(27)
Flr - Ground			47.1480	0.1800	8.4866	75.6000	3564.3888 (28a)
Wl - Brick (Timber Frame)	97.1030	13.3520	83.7510	0.2100	17.5877	7.4000	619.7574 (29a)
Rf - Ins Joist	47.1480		47.1480	0.0800	3.7718	7.4000	348.8952 (30)
Total net area of external elements Aum(A, m ²)			191.4070				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	47.2955		(33)
Party Wall			46.2040	0.0000	0.0000	7.4000	341.9096 (32)
Stud			76.8070			7.4000	568.3715 (32c)
Internal Floor			47.1480			7.4000	348.8952 (32d)
Internal Ceiling			47.1480			7.4000	348.8952 (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	
45.5117	45.2519	44.9972	43.8011	43.5773	42.5355	42.5355	42.3425	42.9368	43.5773	44.0300	44.5033 (38)	
Heat transfer coeff												
109.4387	109.1789	108.9242	107.7281	107.5043	106.4625	106.4625	106.2695	106.8637	107.5043	107.9570	108.4303 (39)	
Average = Sum(39)m / 12 =												107.7270 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.1605	1.1578	1.1551	1.1424	1.1400	1.1290	1.1290	1.1269	1.1332	1.1400	1.1448	1.1498 (40)	
HLP (average)												1.1424 (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												2.6801 (42)
Average daily hot water use (litres/day)												97.8530 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
107.6383	103.7242	99.8100	95.8959	91.9818	88.0677	88.0677	91.9818	95.8959	99.8100	103.7242	107.6383 (44)	
Energy conte	159.6245	139.6086	144.0635	125.5981	120.5144	103.9947	96.3664	110.5819	111.9025	130.4116	142.3545	154.5878 (45)
Energy content (annual)												Total = Sum(45)m = 1539.6084 (45)
Distribution loss (46)m = 0.15 x (45)m												

	23.9437	20.9413	21.6095	18.8397	18.0772	15.5992	14.4550	16.5873	16.7854	19.5617	21.3532	23.1882 (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	0.6471	0.5420	0.4988	0.4121	0.3819	0.4577	0.4829	0.5857	0.6205	0.6497 (61)	
Total heat required for water heating calculated for each month	160.2953	140.2171	144.7106	126.1401	121.0132	104.4069	96.7483	111.0396	112.3854	130.9974	142.9750	155.2374 (62)	
WWHRS	-52.5899	-46.2724	-47.2270	-38.8566	-36.0790	-29.7633	-25.1894	-30.4986	-31.3885	-38.8026	-44.9478	-50.8306 eq. (G10)	
Total of WWHRS savings												-472.4457	
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								Solar input (sum of months) = Sum(63)m =					0.0000 (63)
	107.7054	93.9447	97.4836	87.2835	84.9342	74.6436	71.5589	80.5409	80.9970	92.1948	98.0272	104.4068 (64)	
								Total per year (kWh/year) = Sum(64)m =					1073.7206 (64)
Heat gains from water heating, kWh/month													
	53.2428	46.5720	48.0629	41.8969	40.1957	34.6813	32.1373	36.8829	37.3283	43.5083	47.4880	51.5628 (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												3352.6674 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	539.0209	444.2755	405.7073	277.4655	170.3264	0.0000	0.0000	0.0000	0.0000	245.3537	395.0996	546.8570 (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)	597.5842	492.5449	449.7864	307.6114	188.8320	0.0000	0.0000	0.0000	0.0000	272.0108	438.0262	606.2716 (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	107.7054	93.9447	97.4836	87.2835	84.9342	74.6436	71.5589	80.5409	80.9970	92.1948	98.0272	104.4068 (64)
Efficiency of water heater (217)m	87.5659	87.4431	87.1503	86.4627	85.0862	76.4000	76.4000	76.4000	76.4000	85.9592	87.0735	76.4000 (216)
Fuel for water heating, kWh/month	122.9993	107.4353	111.8569	100.9492	99.8213	97.7010	93.6635	105.4201	106.0170	107.2542	112.5798	119.1022 (219)
Water heating fuel used												1284.7997 (219)
Annual totals kWh/year												
Space heating fuel - main system												3352.6674 (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)												429.0080 (232)
Total delivered energy for all uses												5141.4751 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3352.6674	3.4800	116.6728 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1284.7997	3.4800	44.7110 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	429.0080	13.1900	56.5862 (250)
Additional standing charges			120.0000 (251)
Total energy cost			347.8625 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.0488 (257)
SAP value		85.3688
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	3352.6674	0.2160	724.1762 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1284.7997	0.2160	277.5167 (264)
Space and water heating			1001.6929 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	429.0080	0.5190	222.6552 (268)
Total kg/year			1263.2731 (272)
CO2 emissions per m2			13.4000 (273)
EI value			87.8479
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	$3.48 / 0.8333 = 4.176$, stars = 5
Water heating environmental impact	$0.216 / 0.8333 = 0.2592$, 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	47.1500 (1b)	x 2.3700 (2b)	= 111.7455 (1b) - (3b)
First floor	47.1500 (1c)	x 2.6200 (2c)	= 123.5330 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 235.2785 (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) = 0.1275 (8)
Pressure test					Yes
Measured/design AP50					4.4900
Infiltration rate					0.3520 (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) =	0.3256 (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	0.3989	0.3744	0.3663	0.3419	0.3419	0.3337	0.3337	0.3256	0.3256	0.3500	0.3500	0.3582 (22b)
Effective ac	0.5795	0.5701	0.5671	0.5584	0.5584	0.5557	0.5557	0.5530	0.5530	0.5613	0.5613	0.5641 (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)			11.2600	1.3258	14.9413		(27)
Flr - Ground			47.1480	0.1800	8.4866	75.6000	3564.3888 (28a)
Wl - Brick (Timber Frame)	97.1030	13.3520	83.7510	0.2100	17.5877	7.4000	619.7574 (29a)
Rf - Ins Joist	47.1480		47.1480	0.0800	3.7718	7.4000	348.8952 (30)
Total net area of external elements Aum(A, m ²)			191.4070				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	47.2955		(33)
Party Wall			46.2040	0.0000	0.0000	7.4000	341.9096 (32)
Stud			76.8070			7.4000	568.3715 (32c)
Internal Floor			47.1480			7.4000	348.8952 (32d)
Internal Ceiling			47.1480			7.4000	348.8952 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 6141.1129 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 65.1231 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 16.6315 (36)
Total fabric heat loss (33) + (36) = 63.9270 (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	44.9972	44.2641	44.0300	43.3586	43.3586	43.1451	43.1451	42.9368	42.9368	43.5773	43.5773	43.8011 (38)
Heat transfer coeff	108.9242	108.1911	107.9570	107.2856	107.2856	107.0721	107.0721	106.8637	106.8637	107.5043	107.5043	107.7281 (39)
Average = Sum(39)m / 12 =												107.5210 (39)
HLP	1.1551	1.1473	1.1448	1.1377	1.1377	1.1354	1.1354	1.1332	1.1332	1.1400	1.1400	1.1424 (40)
HLP (average)												1.1402 (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												2.6801 (42)
Average daily hot water use (litres/day)												97.8530 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	107.6383	103.7242	99.8100	95.8959	91.9818	88.0677	88.0677	91.9818	95.8959	99.8100	103.7242	107.6383 (44)
Energy conte	159.6245	139.6086	144.0635	125.5981	120.5144	103.9947	96.3664	110.5819	111.9025	130.4116	142.3545	154.5878 (45)
Energy content (annual)												Total = Sum(45)m = 1539.6084 (45)
Distribution loss (46)m = 0.15 x (45)m												

Water storage loss:	23.9437	20.9413	21.6095	18.8397	18.0772	15.5992	14.4550	16.5873	16.7854	19.5617	21.3532	23.1882 (46)
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	0.6471	0.5420	0.4988	0.4121	0.3819	0.4577	0.4829	0.5857	0.6205	0.6497 (61)
Total heat required for water heating calculated for each month	160.2953	140.2171	144.7106	126.1401	121.0132	104.4069	96.7483	111.0396	112.3854	130.9974	142.9750	155.2374 (62)
WWHRS	-52.5899	-46.2724	-47.2270	-38.8566	-36.0790	-29.7633	-25.1894	-30.4986	-31.3885	-38.8026	-44.9478	-50.8306 eq. (G10)
Total of WWHRS savings												-472.4457
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								Solar input (sum of months) = Sum(63)m =				0.0000 (63)
	107.7054	93.9447	97.4836	87.2835	84.9342	74.6436	71.5589	80.5409	80.9970	92.1948	98.0272	104.4068 (64)
								Total per year (kWh/year) = Sum(64)m =				1073.7206 (64)
Heat gains from water heating, kWh/month	53.2428	46.5720	48.0629	41.8969	40.1957	34.6813	32.1373	36.8829	37.3283	43.5083	47.4880	51.5628 (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													2751.8106 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	464.1160	387.4840	343.5593	222.5123	117.8018	0.0000	0.0000	0.0000	0.0000	171.0906	312.7689	462.8002	(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)	514.5411	429.5832	380.8862	246.6877	130.6007	0.0000	0.0000	0.0000	0.0000	189.6791	346.7504	513.0823	(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	107.7054	93.9447	97.4836	87.2835	84.9342	74.6436	71.5589	80.5409	80.9970	92.1948	98.0272	104.4068	(64)
Efficiency of water heater (217)m	87.2322	87.1289	86.7371	85.8319	83.8545	76.4000	76.4000	76.4000	76.4000	84.8342	86.4728	76.4000	(216)
Fuel for water heating, kWh/month	123.4698	107.8226	112.3898	101.6911	101.2875	97.7010	93.6635	105.4201	106.0170	108.6765	113.3619	119.5989	(219)
Water heating fuel used												1291.0998	(219)
Annual totals kWh/year													
Space heating fuel - main system												2751.8106	(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)												429.0080	(232)
Total delivered energy for all uses												4546.9184	(238)

10a. Fuel costs - using BEDF prices (542)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2751.8106	7.6100	209.4128 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1291.0998	7.6100	98.2527 (247)
Pumps and fans for heating	75.0000	31.0800	23.3100 (249)
Energy for lighting	429.0080	31.0800	133.3357 (250)
Additional standing charges			105.0000 (251)
Total energy cost			569.3112 (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	2751.8106	0.2160	594.3911 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1291.0998	0.2160	278.8776 (264)
Space and water heating			873.2686 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	429.0080	0.5190	222.6552 (268)
Total kg/year			1134.8488 (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	2751.8106	1.2200	3357.2089 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1291.0998	1.2200	1575.1417 (264)
Space and water heating			4932.3506 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	429.0080	3.0700	1317.0546 (268)
Primary energy kWh/year			6479.6553 (272)
Primary energy kWh/m2/year			68.7132 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 85
Current environmental impact rating: B 88

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As 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
F	Already installed
G	Not considered
H	Not considered
I	Not considered
J	Not considered
K	Not considered
M	Not considered
N	Solar water heating
O	SAP increase too small
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U	Solar photovoltaic panels
A2	Recommended
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
L2	Not applicable
Q3	Not considered
O3	Not considered

Recommended measures:	SAP change	Cost change	CO2 change
U Solar photovoltaic panels	+ 9.6	-£ 605	-1010 kg (89.0%)

Measures omitted - SAP change or cost saving too small:

N Solar water heating	+ 0.9	-£ 46	-148 kg (13.0%)
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Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar photovoltaic panels	£605 10.71 kg/m²	A 95	A 96
Total Savings	£605 10.71 kg/m²		
Potential energy efficiency rating:		A 95	
Potential environmental impact rating:			A 96

Fuel prices for cost data on this page from database revision number 542 TEST (30 Apr 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	£413	£413	£0
Space heating	£338	£338	£0
Water heating	£98	£98	£0
Lighting	£133	£133	£0
Generated (PV)	-£0	-£605	£605
Total cost of fuels	£570	-£35	£605
Total cost of uses	£569	-£36	£605
Delivered energy	48 kWh/m²	28 kWh/m²	21 kWh/m²
Carbon dioxide emissions	1.1 tonnes	0.1 tonnes	1.0 tonnes
CO2 emissions per m²	12 kg/m²	1 kg/m²	11 kg/m²
Primary energy	69 kWh/m²	5 kWh/m²	63 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	47.1500 (1b)	x 2.3700 (2b)	= 111.7455 (1b) - (3b)
First floor	47.1500 (1c)	x 2.6200 (2c)	= 123.5330 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 235.2785 (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) = 0.1275 (8)
Pressure test					Yes
Measured/design AP50					4.4900
Infiltration rate					0.3520 (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) =	0.3256 (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	0.4151	0.4070	0.3989	0.3582	0.3500	0.3093	0.3093	0.3012	0.3256	0.3500	0.3663	0.3826 (22b)
Effective ac	0.5862	0.5828	0.5795	0.5641	0.5613	0.5478	0.5478	0.5454	0.5530	0.5613	0.5671	0.5732 (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)			11.2600	1.3258	14.9413		(27)
Flr - Ground			47.1480	0.1800	8.4866	75.6000	3564.3888 (28a)
Wl - Brick (Timber Frame)	97.1030	13.3520	83.7510	0.2100	17.5877	7.4000	619.7574 (29a)
Rf - Ins Joist	47.1480		47.1480	0.0800	3.7718	7.4000	348.8952 (30)
Total net area of external elements Aum(A, m ²)			191.4070				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	47.2955		(33)
Party Wall			46.2040	0.0000	0.0000	7.4000	341.9096 (32)
Stud			76.8070			7.4000	568.3715 (32c)
Internal Floor			47.1480			7.4000	348.8952 (32d)
Internal Ceiling			47.1480			7.4000	348.8952 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 6141.1129 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 65.1231 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 16.6315 (36)
Total fabric heat loss (33) + (36) = 63.9270 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	45.5117	45.2519	44.9972	43.8011	43.5773	42.5355	42.5355	42.3425	42.9368	43.5773	44.0300	44.5033 (38)
Heat transfer coeff	109.4387	109.1789	108.9242	107.7281	107.5043	106.4625	106.4625	106.2695	106.8637	107.5043	107.9570	108.4303 (39)
Average = Sum(39)m / 12 =												107.7270 (39)
HLP	1.1605	1.1578	1.1551	1.1424	1.1400	1.1290	1.1290	1.1269	1.1332	1.1400	1.1448	1.1498 (40)
HLP (average)												1.1424 (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												2.6801 (42)
Average daily hot water use (litres/day)												97.8530 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	107.6383	103.7242	99.8100	95.8959	91.9818	88.0677	88.0677	91.9818	95.8959	99.8100	103.7242	107.6383 (44)
Energy conte	159.6245	139.6086	144.0635	125.5981	120.5144	103.9947	96.3664	110.5819	111.9025	130.4116	142.3545	154.5878 (45)
Energy content (annual)												Total = Sum(45)m = 1539.6084 (45)
Distribution loss (46)m = 0.15 x (45)m												

Water storage loss:	23.9437	20.9413	21.6095	18.8397	18.0772	15.5992	14.4550	16.5873	16.7854	19.5617	21.3532	23.1882 (46)
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	0.6471	0.5420	0.4988	0.4121	0.3819	0.4577	0.4829	0.5857	0.6205	0.6497 (61)
Total heat required for water heating calculated for each month	160.2953	140.2171	144.7106	126.1401	121.0132	104.4069	96.7483	111.0396	112.3854	130.9974	142.9750	155.2374 (62)
WWHRS	-52.5899	-46.2724	-47.2270	-38.8566	-36.0790	-29.7633	-25.1894	-30.4986	-31.3885	-38.8026	-44.9478	-50.8306 eq. (G10)
Total of WWHRS savings												-472.4457
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								Solar input (sum of months) = Sum(63)m =				0.0000 (63)
	107.7054	93.9447	97.4836	87.2835	84.9342	74.6436	71.5589	80.5409	80.9970	92.1948	98.0272	104.4068 (64)
								Total per year (kWh/year) = Sum(64)m =				1073.7206 (64)
Heat gains from water heating, kWh/month	53.2428	46.5720	48.0629	41.8969	40.1957	34.6813	32.1373	36.8829	37.3283	43.5083	47.4880	51.5628 (65)

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												3352.6674	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	539.0209	444.2755	405.7073	277.4655	170.3264	0.0000	0.0000	0.0000	0.0000	245.3537	395.0996	546.8570	(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)	597.5842	492.5449	449.7864	307.6114	188.8320	0.0000	0.0000	0.0000	0.0000	272.0108	438.0262	606.2716	(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	107.7054	93.9447	97.4836	87.2835	84.9342	74.6436	71.5589	80.5409	80.9970	92.1948	98.0272	104.4068	(64)
Efficiency of water heater (217)m	87.5659	87.4431	87.1503	86.4627	85.0862	76.4000	76.4000	76.4000	76.4000	85.9592	87.0735	76.4000	(216)
Fuel for water heating, kWh/month	122.9993	107.4353	111.8569	100.9492	99.8213	97.7010	93.6635	105.4201	106.0170	107.2542	112.5798	119.1022	(219)
Water heating fuel used												1284.7997	(219)
Annual totals kWh/year													
Space heating fuel - main system												3352.6674	(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)												429.0080	(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												3414.2357	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3352.6674	3.4800	116.6728 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1284.7997	3.4800	44.7110 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	429.0080	13.1900	56.5862 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-1727.2394	13.1900	-227.8229 (252)
Total energy cost			120.0396 (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] =	0.3619 (257)
SAP value	94.9511	
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	3352.6674	0.2160	724.1762 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1284.7997	0.2160	277.5167 (264)
Space and water heating			1001.6929 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	429.0080	0.5190	222.6552 (268)
Energy saving/generation technologies			
PV Unit	-1727.2394	0.5190	-896.4372 (269)
Total kg/year			366.8358 (272)
CO2 emissions per m2			3.8900 (273)
EI value			96.4712
EI rating			96
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	47.1500 (1b)	x 2.3700 (2b)	= 111.7455 (1b) - (3b)
First floor	47.1500 (1c)	x 2.6200 (2c)	= 123.5330 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 235.2785 (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) = 0.1275 (8)
Pressure test					Yes
Measured/design AP50					4.4900
Infiltration rate					0.3520 (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) =	0.3256 (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	0.3989	0.3744	0.3663	0.3419	0.3419	0.3337	0.3337	0.3256	0.3256	0.3500	0.3500	0.3582 (22b)
Effective ac	0.5795	0.5701	0.5671	0.5584	0.5584	0.5557	0.5557	0.5530	0.5530	0.5613	0.5613	0.5641 (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)			11.2600	1.3258	14.9413		(27)
Flr - Ground			47.1480	0.1800	8.4866	75.6000	3564.3888 (28a)
Wl - Brick (Timber Frame)	97.1030	13.3520	83.7510	0.2100	17.5877	7.4000	619.7574 (29a)
Rf - Ins Joist	47.1480		47.1480	0.0800	3.7718	7.4000	348.8952 (30)
Total net area of external elements Aum(A, m ²)			191.4070				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	47.2955		(33)
Party Wall			46.2040	0.0000	0.0000	7.4000	341.9096 (32)
Stud			76.8070			7.4000	568.3715 (32c)
Internal Floor			47.1480			7.4000	348.8952 (32d)
Internal Ceiling			47.1480			7.4000	348.8952 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 6141.1129 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 65.1231 (35)
 Thermal bridges (Sum(L x Psi) calculated using Appendix K) 16.6315 (36)
 Total fabric heat loss (33) + (36) = 63.9270 (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	44.9972	44.2641	44.0300	43.3586	43.3586	43.1451	43.1451	42.9368	42.9368	43.5773	43.5773	43.8011 (38)
Heat transfer coeff	108.9242	108.1911	107.9570	107.2856	107.2856	107.0721	107.0721	106.8637	106.8637	107.5043	107.5043	107.7281 (39)
Average = Sum(39)m / 12 =												107.5210 (39)
HLP	1.1551	1.1473	1.1448	1.1377	1.1377	1.1354	1.1354	1.1332	1.1332	1.1400	1.1400	1.1424 (40)
HLP (average)												1.1402 (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												2.6801 (42)
Average daily hot water use (litres/day)												97.8530 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	107.6383	103.7242	99.8100	95.8959	91.9818	88.0677	88.0677	91.9818	95.8959	99.8100	103.7242	107.6383 (44)
Energy conte	159.6245	139.6086	144.0635	125.5981	120.5144	103.9947	96.3664	110.5819	111.9025	130.4116	142.3545	154.5878 (45)
Energy content (annual)												Total = Sum(45)m = 1539.6084 (45)
Distribution loss (46)m = 0.15 x (45)m												

Water storage loss:	23.9437	20.9413	21.6095	18.8397	18.0772	15.5992	14.4550	16.5873	16.7854	19.5617	21.3532	23.1882 (46)
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	0.6471	0.5420	0.4988	0.4121	0.3819	0.4577	0.4829	0.5857	0.6205	0.6497 (61)
Total heat required for water heating calculated for each month	160.2953	140.2171	144.7106	126.1401	121.0132	104.4069	96.7483	111.0396	112.3854	130.9974	142.9750	155.2374 (62)
WWHRS	-52.5899	-46.2724	-47.2270	-38.8566	-36.0790	-29.7633	-25.1894	-30.4986	-31.3885	-38.8026	-44.9478	-50.8306 eq. (G10)
Total of WWHRS savings												-472.4457
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								Solar input (sum of months) = Sum(63)m =				0.0000 (63)
	107.7054	93.9447	97.4836	87.2835	84.9342	74.6436	71.5589	80.5409	80.9970	92.1948	98.0272	104.4068 (64)
								Total per year (kWh/year) = Sum(64)m =				1073.7206 (64)
Heat gains from water heating, kWh/month	53.2428	46.5720	48.0629	41.8969	40.1957	34.6813	32.1373	36.8829	37.3283	43.5083	47.4880	51.5628 (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													2751.8106 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	464.1160	387.4840	343.5593	222.5123	117.8018	0.0000	0.0000	0.0000	0.0000	171.0906	312.7689	462.8002	(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)	514.5411	429.5832	380.8862	246.6877	130.6007	0.0000	0.0000	0.0000	0.0000	189.6791	346.7504	513.0823	(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	107.7054	93.9447	97.4836	87.2835	84.9342	74.6436	71.5589	80.5409	80.9970	92.1948	98.0272	104.4068	(64)
Efficiency of water heater (217)m	87.2322	87.1289	86.7371	85.8319	83.8545	76.4000	76.4000	76.4000	76.4000	84.8342	86.4728	87.2975	(216)
Fuel for water heating, kWh/month	123.4698	107.8226	112.3898	101.6911	101.2875	97.7010	93.6635	105.4201	106.0170	108.6765	113.3619	119.5989	(217)
Water heating fuel used												1291.0998	(219)
Annual totals kWh/year													
Space heating fuel - main system												2751.8106	(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)												429.0080	(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												2600.4724	(238)

10a. Fuel costs - using BEDF prices (542)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2751.8106	7.6100	209.4128 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1291.0998	7.6100	98.2527 (247)
Pumps and fans for heating	75.0000	31.0800	23.3100 (249)
Energy for lighting	429.0080	31.0800	133.3357 (250)
Additional standing charges			105.0000 (251)
Energy saving/generation technologies			
PV Unit	-1946.4459	31.0800	-604.9554 (252)
Total energy cost			-35.6442 (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	2751.8106	0.2160	594.3911 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1291.0998	0.2160	278.8776 (264)
Space and water heating			873.2686 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	429.0080	0.5190	222.6552 (268)
Energy saving/generation technologies			
PV Unit	-1946.4459	0.5190	-1010.2054 (269)
Total kg/year			124.6434 (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	2751.8106	1.2200	3357.2089 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1291.0998	1.2200	1575.1417 (264)
Space and water heating			4932.3506 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	429.0080	3.0700	1317.0546 (268)
Energy saving/generation technologies			
PV Unit	-1946.4459	3.0700	-5975.5890 (269)
Primary energy kWh/year			504.0662 (272)
Primary energy kWh/m2/year			5.3453 (273)

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Built)

Property Reference	047 - PRJ013014	Issued on Date	09/05/2024
Assessment Reference	047	Prop Type Ref	3B
Property	3 Rashleigh Drive, Netley Abbey, Southampton, SO31 5JY		
SAP Rating	85 B	DER	14.40
Environmental	88 B	% DER<TER	18.24
CO₂ Emissions (t/year)	1.13	DFEE	44.38
General Requirements Compliance	Pass	% DFEE<TFEE	12.38
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)	17.61	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.40	kgCO ₂ /m ²	Pass
	-3.21 (-18.2%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	50.66	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	44.38	kWh/m ² /yr	
	-6.3 (-12.4%)	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	4.49 (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 North

7.72 m², No overhang

Windows facing South

3.55 m², No overhang

Air change rate

4.65 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