

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

Property Reference	015 - PRJ013014	Issued on Date	02/05/2024
Assessment Reference	015	Prop Type Ref	2B
Property	11 Deeble Way, Netley Abbey, Southampton, SO31 5JP		

SAP Rating	85 B	DER	15.18	TER	18.52
Environmental	88 B	% DER<TER	18.06		
CO ₂ Emissions (t/year)	1.04	DFEE	45.81	TFEE	51.59
General Requirements Compliance	Pass	% DFEE<TFEE	11.20		

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	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									4.6700			
Infiltration rate									0.3805 (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) =	0.3519 (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	0.4311	0.4047	0.3959	0.3695	0.3695	0.3607	0.3607	0.3519	0.3519	0.3783	0.3783	0.3871 (22b)
Effective ac	0.5929	0.5819	0.5784	0.5683	0.5683	0.5651	0.5651	0.5619	0.5619	0.5716	0.5716	0.5749 (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	0.1800	7.3638	75.6000	3092.7960 (28a)
Wl - Brick (Timber Frame)	90.3710	11.1690	79.2020	0.2100	16.6324	7.4000	586.0948 (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)			172.1940				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.8151		(33)
Party Wall			46.2040	0.0000	0.0000	7.4000	341.9096 (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)							15.3835 (36)
Total fabric heat loss							(33) + (36) = 57.1986 (37)

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

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(38)m	Jan 39.9434	Feb 39.2003	Mar 38.9630	Apr 38.2825	May 38.2825	Jun 38.0661	Jul 38.0661	Aug 37.8549	Sep 37.8549	Oct 38.5041	Nov 38.5041	Dec 38.7310 (38)
Heat transfer coeff	97.1419	96.3988	96.1616	95.4811	95.4811	95.2647	95.2647	95.0535	95.0535	95.7027	95.7027	95.9295 (39)
Average = Sum(39)m / 12 =												95.7196 (39)
HLP	Jan 1.1873	Feb 1.1782	Mar 1.1753	Apr 1.1670	May 1.1670	Jun 1.1643	Jul 1.1643	Aug 1.1617	Sep 1.1617	Oct 1.1697	Nov 1.1697	Dec 1.1724 (40)
HLP (average)												1.1699 (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
Northeast				6.3550	14.6130	0.7300	0.7200			0.7700			33.8255 (75)
Southwest				2.7240	45.0642	0.7300	0.7200			0.7700			44.7123 (79)
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 15.5907	Feb 15.7109	Mar 15.7497	Apr 15.8619	May 15.8619	Jun 15.8979	Jul 15.8979	Aug 15.9333	Sep 15.9333	Oct 15.8252	Nov 15.8252	Dec 15.7877
alpha	2.0394	2.0474	2.0500	2.0575	2.0575	2.0599	2.0599	2.0622	2.0622	2.0550	2.0550	2.0525
util living area	0.8890	0.8726	0.8326	0.7585	0.6471	0.4837	0.3629	0.3679	0.5773	0.7572	0.8526	0.8949 (86)
MIT	18.5372	18.7290	19.1965	19.8115	20.3823	20.7763	20.9167	20.9174	20.6599	20.0526	19.2567	18.5372 (87)
Th 2	19.9302	19.9375	19.9398	19.9465	19.9465	19.9487	19.9487	19.9507	19.9507	19.9443	19.9443	19.9421 (88)
util rest of house	0.8761	0.8580	0.8125	0.7277	0.5971	0.4064	0.2600	0.2606	0.5023	0.7176	0.8324	0.8825 (89)
MIT 2	16.7266	17.0000	17.6613	18.5188	19.2846	19.7641	19.9052	19.9091	19.6462	18.8656	17.7592	16.7318 (90)
Living area fraction									fLA = Living area / (4) =			0.1678 (91)

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MIT	17.0305	17.2901	17.9189	18.7357	19.4688	19.9339	20.0749	20.0783	19.8163	19.0648	18.0105	17.0348 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.8805	17.1401	17.7689	18.5857	19.3188	19.7839	19.9249	19.9283	19.6663	18.9148	17.8605	16.8848 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8248	0.8056	0.7594	0.6796	0.5630	0.3932	0.2575	0.2581	0.4793	0.6702	0.7794	0.8323 (94)	
Useful gains	528.9578	549.1149	557.7479	539.8013	458.0502	327.9136	201.2521	192.0731	330.1665	427.3905	478.9779	509.5143 (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													
	1086.0922	1064.2541	968.2430	810.2255	593.7759	370.0029	211.9544	202.3037	396.0201	633.0539	867.1103	1063.3562 (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													
	414.5080	346.1735	305.4084	194.7055	100.9799	0.0000	0.0000	0.0000	0.0000	153.0136	279.4553	412.0584 (98)	
Space heating												2206.3026 (98)	
RHI space heating demand												2206 (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	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					4.6700
Infiltration rate					0.3805 (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) =	0.3519 (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	0.4487	0.4399	0.4311	0.3871	0.3783	0.3343	0.3343	0.3255	0.3519	0.3783	0.3959	0.4135 (22b)
Effective ac	0.6007	0.5968	0.5929	0.5749	0.5716	0.5559	0.5559	0.5530	0.5619	0.5716	0.5784	0.5855 (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	0.1800	7.3638	75.6000	3092.7960 (28a)
Wl - Brick (Timber Frame)	90.3710	11.1690	79.2020	0.2100	16.6324	7.4000	586.0948 (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)			172.1940				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.8151		(33)
Party Wall			46.2040	0.0000	0.0000	7.4000	341.9096 (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)
15.3835 (36)
(33) + (36) = 57.1986 (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	40.4648	40.2015	39.9434	38.7310	38.5041	37.4482	37.4482	37.2526	37.8549	38.5041	38.9630	39.4428 (38)
Heat transfer coeff	97.6634	97.4000	97.1419	95.9295	95.7027	94.6467	94.6467	94.4512	95.0535	95.7027	96.1616	96.6413 (39)
Average = Sum(39)m / 12 =												95.9284 (39)
HLP	1.1936	1.1904	1.1873	1.1724	1.1697	1.1568	1.1568	1.1544	1.1617	1.1697	1.1753	1.1811 (40)
HLP (average)												1.1724 (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												Total = Sum(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	Solar flux	g		FF	Access		Gains	
				m2	Table 6a	Specific data		Specific data	factor		W	
					W/m2	or Table 6b		or Table 6c	Table 6d			
Northeast				6.3550	11.2829	0.7300		0.7200	0.7700		26.1172 (75)	
Southwest				2.7240	36.7938	0.7300		0.7200	0.7700		36.5065 (79)	
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, nll,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	15.5075	15.5494	15.5907	15.7877	15.8252	16.0017	16.0017	16.0349	15.9333	15.8252	15.7497	15.6715
alpha	2.0338	2.0366	2.0394	2.0525	2.0550	2.0668	2.0668	2.0690	2.0622	2.0550	2.0500	2.0448
util living area	0.9072	0.8896	0.8581	0.7992	0.7097	0.5871	0.4720	0.5079	0.6741	0.8159	0.8846	0.9135 (86)
MIT	18.1487	18.3979	18.8657	19.5108	20.1180	20.5931	20.8178	20.7809	20.4167	19.6613	18.8111	18.1014 (87)
Th 2	19.9251	19.9277	19.9302	19.9421	19.9443	19.9547	19.9547	19.9567	19.9507	19.9443	19.9398	19.9351 (88)
util rest of house	0.8969	0.8774	0.8417	0.7743	0.6700	0.5237	0.3828	0.4201	0.6172	0.7881	0.8699	0.9039 (89)
MIT 2	16.1688	16.5241	17.1901	18.1018	18.9357	19.5596	19.8199	19.7861	19.3495	18.3287	17.1248	16.1044 (90)
Living area fraction									fLA = Living area / (4) =			0.1678 (91)
MIT	16.5010	16.8386	17.4712	18.3383	19.1341	19.7330	19.9873	19.9531	19.5286	18.5523	17.4077	16.4395 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.3510	16.6886	17.3212	18.1883	18.9841	19.5830	19.8373	19.8031	19.3786	18.4023	17.2577	16.2895 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8482	0.8262	0.7884	0.7227	0.6275	0.4984	0.3718	0.4058	0.5808	0.7358	0.8184	0.8566 (94)
Useful gains	530.4415	556.1663	564.6176	551.8315	499.0138	387.3844	275.3416	282.9514	380.2054	451.8347	487.1669	513.9933 (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	1176.9458	1148.2065	1051.1965	891.0202	697.1094	471.6274	306.4024	321.4242	501.7507	746.7034	976.7849	1168.3450 (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	480.9992	397.8511	362.0147	244.2159	147.3831	0.0000	0.0000	0.0000	0.0000	219.3823	352.5249	486.8376 (98)
Space heating												2691.2088 (98)
Space heating per m2												32.8918 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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												2983.6018 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	480.9992	397.8511	362.0147	244.2159	147.3831	0.0000	0.0000	0.0000	0.0000	219.3823	352.5249	486.8376 (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)	533.2586	441.0766	401.3467	270.7493	163.3959	0.0000	0.0000	0.0000	0.0000	243.2176	390.8258	539.7313 (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	87.4002	87.2800	86.9675	86.2171	84.7437	76.4000	76.4000	76.4000	76.4000	85.7443	86.8874	76.4000 (216)
Fuel for water heating, kWh/month	118.6434	103.6223	107.8503	97.3388	96.3320	93.8672	89.9191	101.2456	101.8344	103.3371	108.5459	114.8849 (219)
Water heating fuel used												1237.4210 (219)
Annual totals kWh/year												
Space heating fuel - main system												2983.6018 (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												4690.4187 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2983.6018	3.4800	103.8293 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1237.4210	3.4800	43.0622 (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			328.8049 (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] = 1.0889 (257)
SAP value	84.8094
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	2983.6018	0.2160	644.4580 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1237.4210	0.2160	267.2829 (264)
Space and water heating			911.7409 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	394.3960	0.5190	204.6915 (268)
Total kg/year			1155.3574 (272)
CO2 emissions per m2			14.1200 (273)
EI value			87.7923
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	$3.48 / 0.8319 = 4.183$, stars = 5
Water heating environmental impact	$0.216 / 0.8319 = 0.2596$, 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					4.6700
Infiltration rate					0.3805 (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) =	0.3519 (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	0.4311	0.4047	0.3959	0.3695	0.3695	0.3607	0.3607	0.3519	0.3519	0.3783	0.3783	0.3871 (22b)
Effective ac	0.5929	0.5819	0.5784	0.5683	0.5683	0.5651	0.5651	0.5619	0.5619	0.5716	0.5716	0.5749 (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	0.1800	7.3638	75.6000	3092.7960 (28a)
Wl - Brick (Timber Frame)	90.3710	11.1690	79.2020	0.2100	16.6324	7.4000	586.0948 (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)			172.1940				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.8151		(33)
Party Wall			46.2040	0.0000	0.0000	7.4000	341.9096 (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

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	39.9434	39.2003	38.9630	38.2825	38.0661	38.0661	37.8549	37.8549	38.5041	38.5041	38.7310 (38)
Heat transfer coeff	97.1419	96.3988	96.1616	95.4811	95.4811	95.2647	95.2647	95.0535	95.0535	95.7027	95.9295 (39)
Average = Sum(39)m / 12 =											95.7196 (39)
HLP	1.1873	1.1782	1.1753	1.1670	1.1670	1.1643	1.1643	1.1617	1.1617	1.1697	1.1724 (40)
HLP (average)											1.1699 (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
	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 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)

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	Solar flux	g	FF			Access	Gains	
				m2	Table 6a	Specific data	Specific data			factor	W	
					W/m2	or Table 6b	or Table 6c			Table 6d		
Northeast				6.3550	14.6130	0.7300	0.7200			0.7700	33.8255	
Southwest				2.7240	45.0642	0.7300	0.7200			0.7700	(75)	
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
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)											

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	15.5907	15.7109	15.7497	15.8619	15.8619	15.8979	15.8979	15.9333	15.9333	15.8252	15.8252	15.7877
alpha	2.0394	2.0474	2.0500	2.0575	2.0575	2.0599	2.0599	2.0622	2.0622	2.0550	2.0550	2.0525
util living area	0.8890	0.8726	0.8326	0.7585	0.6471	0.4837	0.3629	0.3679	0.5773	0.7572	0.8526	0.8949 (86)
MIT	18.5372	18.7290	19.1965	19.8115	20.3823	20.7763	20.9167	20.9174	20.6599	20.0526	19.2567	18.5372 (87)
Th 2	19.9302	19.9375	19.9398	19.9465	19.9465	19.9487	19.9487	19.9507	19.9507	19.9443	19.9443	19.9421 (88)
util rest of house	0.8761	0.8580	0.8125	0.7277	0.5971	0.4064	0.2600	0.2606	0.5023	0.7176	0.8324	0.8825 (89)
MIT 2	16.7266	17.0000	17.6613	18.5188	19.2846	19.7641	19.9052	19.9091	19.6462	18.8656	17.7592	16.7318 (90)
Living area fraction									fLA = Living area / (4) =			0.1678 (91)
MIT	17.0305	17.2901	17.9189	18.7357	19.4688	19.9339	20.0749	20.0783	19.8163	19.0648	18.0105	17.0348 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.8805	17.1401	17.7689	18.5857	19.3188	19.7839	19.9249	19.9283	19.6663	18.9148	17.8605	16.8848 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8248	0.8056	0.7594	0.6796	0.5630	0.3932	0.2575	0.2581	0.4793	0.6702	0.7794	0.8323 (94)
Useful gains	528.9578	549.1149	557.7479	539.8013	458.0502	327.9136	201.2521	192.0731	330.1665	427.3905	478.9779	509.5143 (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	1086.0922	1064.2541	968.2430	810.2255	593.7759	370.0029	211.9544	202.3037	396.0201	633.0539	867.1103	1063.3562 (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	414.5080	346.1735	305.4084	194.7055	100.9799	0.0000	0.0000	0.0000	0.0000	153.0136	279.4553	412.0584 (98)
Space heating												2206.3026 (98)
Space heating per m2												26.9653 (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 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													2446.0117 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	414.5080	346.1735	305.4084	194.7055	100.9799	0.0000	0.0000	0.0000	0.0000	153.0136	279.4553	412.0584	(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)	459.5432	383.7844	338.5902	215.8597	111.9511	0.0000	0.0000	0.0000	0.0000	169.6381	309.8174	456.8275	(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	87.0535	86.9468	86.5278	85.5459	83.4608	76.4000	76.4000	76.4000	76.4000	84.5964	86.2681	76.4000	(216)
Fuel for water heating, kWh/month	119.1159	104.0193	108.3984	98.1025	97.8128	93.8672	89.9191	101.2456	101.8344	104.7393	109.3252	115.3874	(219)
Water heating fuel used												1243.7671	(219)
Annual totals kWh/year													
Space heating fuel - main system												2446.0117	(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												4159.1749	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2446.0117	7.6100	186.1415 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1243.7671	7.6100	94.6507 (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			531.6805 (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	2446.0117	0.2160	528.3385 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1243.7671	0.2160	268.6537 (264)
Space and water heating			796.9922 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	394.3960	0.5190	204.6915 (268)
Total kg/year			1040.6088 (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	2446.0117	1.2200	2984.1343 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1243.7671	1.2200	1517.3959 (264)
Space and water heating			4501.5302 (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			5942.5760 (272)
Primary energy kWh/m2/year			72.6299 (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	+ 10.5	-£ 605	-1010 kg (97.1%)

Measures omitted - SAP change or cost saving too small:

N Solar water heating	+ 0.9	-£ 44	-143 kg (13.7%)
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Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar photovoltaic panels	£605 12.35 kg/m²	A 95	A 97
Total Savings	£605 12.35 kg/m²		
Potential energy efficiency rating:		A 95	
Potential environmental impact rating:			A 97

Fuel prices for cost data on this page from database revision number 540 TEST (28 Mar 2024)
Recommendation texts revision number 4.9c (22 Feb 2014)

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

	Current	Potential	Saving
Electricity	£146	£146	£0
Mains gas	£386	£386	£0
Space heating	£314	£314	£0
Water heating	£95	£95	£0
Lighting	£123	£123	£0
Generated (PV)	-£0	-£605	£605
Total cost of fuels	£532	-£73	£605
Total cost of uses	£532	-£73	£605
Delivered energy	51 kWh/m²	27 kWh/m²	24 kWh/m²
Carbon dioxide emissions	1.0 tonnes	0.0 tonnes	1.0 tonnes
CO2 emissions per m²	13 kg/m²	0 kg/m²	12 kg/m²
Primary energy	73 kWh/m²	0 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					4.6700
Infiltration rate					0.3805 (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) =	0.3519 (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	0.4487	0.4399	0.4311	0.3871	0.3783	0.3343	0.3343	0.3255	0.3519	0.3783	0.3959	0.4135 (22b)
Effective ac	0.6007	0.5968	0.5929	0.5749	0.5716	0.5559	0.5559	0.5530	0.5619	0.5716	0.5784	0.5855 (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	0.1800	7.3638	75.6000	3092.7960 (28a)
Wl - Brick (Timber Frame)	90.3710	11.1690	79.2020	0.2100	16.6324	7.4000	586.0948 (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)			172.1940				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.8151		(33)
Party Wall			46.2040	0.0000	0.0000	7.4000	341.9096 (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/m²K 66.6370 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.3835 (36)
Total fabric heat loss (33) + (36) = 57.1986 (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	40.4648	40.2015	39.9434	38.7310	38.5041	37.4482	37.4482	37.2526	37.8549	38.5041	38.9630	39.4428 (38)
Heat transfer coeff	97.6634	97.4000	97.1419	95.9295	95.7027	94.6467	94.6467	94.4512	95.0535	95.7027	96.1616	96.6413 (39)
Average = Sum(39)m / 12 =												95.9284 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1936	1.1904	1.1873	1.1724	1.1697	1.1568	1.1568	1.1544	1.1617	1.1697	1.1753	1.1811 (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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	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 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												
WWHRS	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)
Total of WWHRS savings	-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)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-444.6741
Output from w/h								Solar input (sum of months) =	Sum(63)m =			0.0000 (63)
	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)
								Total per year (kWh/year) =	Sum(64)m =			1032.4919 (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	Solar flux	g		FF	Access		Gains	
				m2	Table 6a	Specific data		Specific data	factor		W	
					W/m2	or Table 6b		or Table 6c	Table 6d			
Northeast				6.3550	11.2829	0.7300		0.7200	0.7700		26.1172 (75)	
Southwest				2.7240	36.7938	0.7300		0.7200	0.7700		36.5065 (79)	
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, nll,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	15.5075	15.5494	15.5907	15.7877	15.8252	16.0017	16.0017	16.0349	15.9333	15.8252	15.7497	15.6715
alpha	2.0338	2.0366	2.0394	2.0525	2.0550	2.0668	2.0668	2.0690	2.0622	2.0550	2.0500	2.0448
util living area	0.9072	0.8896	0.8581	0.7992	0.7097	0.5871	0.4720	0.5079	0.6741	0.8159	0.8846	0.9135 (86)
MIT	18.1487	18.3979	18.8657	19.5108	20.1180	20.5931	20.8178	20.7809	20.4167	19.6613	18.8111	18.1014 (87)
Th 2	19.9251	19.9277	19.9302	19.9421	19.9443	19.9547	19.9547	19.9567	19.9507	19.9443	19.9398	19.9351 (88)
util rest of house	0.8969	0.8774	0.8417	0.7743	0.6700	0.5237	0.3828	0.4201	0.6172	0.7881	0.8699	0.9039 (89)
MIT 2	16.1688	16.5241	17.1901	18.1018	18.9357	19.5596	19.8199	19.7861	19.3495	18.3287	17.1248	16.1044 (90)
Living area fraction									fLA = Living area / (4) =			0.1678 (91)
MIT	16.5010	16.8386	17.4712	18.3383	19.1341	19.7330	19.9873	19.9531	19.5286	18.5523	17.4077	16.4395 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.3510	16.6886	17.3212	18.1883	18.9841	19.5830	19.8373	19.8031	19.3786	18.4023	17.2577	16.2895 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8482	0.8262	0.7884	0.7227	0.6275	0.4984	0.3718	0.4058	0.5808	0.7358	0.8184	0.8566 (94)
Useful gains	530.4415	556.1663	564.6176	551.8315	499.0138	387.3844	275.3416	282.9514	380.2054	451.8347	487.1669	513.9933 (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	1176.9458	1148.2065	1051.1965	891.0202	697.1094	471.6274	306.4024	321.4242	501.7507	746.7034	976.7849	1168.3450 (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	480.9992	397.8511	362.0147	244.2159	147.3831	0.0000	0.0000	0.0000	0.0000	219.3823	352.5249	486.8376 (98)
Space heating												2691.2088 (98)
Space heating per m2												32.8918 (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													2983.6018 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	480.9992	397.8511	362.0147	244.2159	147.3831	0.0000	0.0000	0.0000	0.0000	219.3823	352.5249	486.8376	(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)	533.2586	441.0766	401.3467	270.7493	163.3959	0.0000	0.0000	0.0000	0.0000	243.2176	390.8258	539.7313	(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	87.4002	87.2800	86.9675	86.2171	84.7437	76.4000	76.4000	76.4000	76.4000	85.7443	86.8874	76.4000	(216)
Fuel for water heating, kWh/month	118.6434	103.6223	107.8503	97.3388	96.3320	93.8672	89.9191	101.2456	101.8344	103.3371	108.5459	114.8849	(219)
Water heating fuel used												1237.4210	(219)
Annual totals kWh/year													
Space heating fuel - main system												2983.6018	(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												2963.1794	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2983.6018	3.4800	103.8293 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1237.4210	3.4800	43.0622 (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			100.9820 (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] =	0.3344 (257)
SAP value		95.3347
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	2983.6018	0.2160	644.4580 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1237.4210	0.2160	267.2829 (264)
Space and water heating			911.7409 (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			258.9202 (272)
CO2 emissions per m2			3.1600 (273)
EI value			97.2642
EI rating			97 (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 * 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					4.6700
Infiltration rate					0.3805 (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) =	0.3519 (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	0.4311	0.4047	0.3959	0.3695	0.3695	0.3607	0.3607	0.3519	0.3519	0.3783	0.3783	0.3871 (22b)
Effective ac	0.5929	0.5819	0.5784	0.5683	0.5683	0.5651	0.5651	0.5619	0.5619	0.5716	0.5716	0.5749 (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	0.1800	7.3638	75.6000	3092.7960 (28a)
Wl - Brick (Timber Frame)	90.3710	11.1690	79.2020	0.2100	16.6324	7.4000	586.0948 (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)			172.1940				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.8151		(33)
Party Wall			46.2040	0.0000	0.0000	7.4000	341.9096 (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)							15.3835 (36)
Total fabric heat loss							(33) + (36) = 57.1986 (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	39.9434	39.2003	38.9630	38.2825	38.2825	38.0661	38.0661	37.8549	37.8549	38.5041	38.5041	38.7310 (38)
Heat transfer coeff	97.1419	96.3988	96.1616	95.4811	95.4811	95.2647	95.2647	95.0535	95.0535	95.7027	95.7027	95.9295 (39)
Average = Sum(39)m / 12 =												95.7196 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1873	1.1782	1.1753	1.1670	1.1670	1.1643	1.1643	1.1617	1.1617	1.1697	1.1697	1.1724 (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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	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 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												

Design SAP
elmhurst energy

Water storage loss:	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)
Total storage loss												
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Total heat required for water heating calculated for each month	0.6702	0.5948	0.5907	0.4948	0.4554	0.3762	0.3486	0.4178	0.4408	0.5347	0.6065	0.6490 (61)
WWHRS	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)
Total of WWHRS savings	-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)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-444.6741
Output from w/h								Solar input	(sum of months) =	Sum (63)m =		0.0000 (63)
Heat gains from water heating, kWh/month	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)
	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)
								Total per year (kWh/year) =	Sum (64)m =			1032.4919 (64)

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 m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
Northeast				6.3550	14.6130	0.7300	0.7200	0.7700	33.8255 (75)			
Southwest				2.7240	45.0642	0.7300	0.7200	0.7700	44.7123 (79)			
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)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, n _{l,m} (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	15.5907	15.7109	15.7497	15.8619	15.8619	15.8979	15.8979	15.9333	15.9333	15.8252	15.8252	15.7877
alpha	2.0394	2.0474	2.0500	2.0575	2.0575	2.0599	2.0599	2.0622	2.0622	2.0550	2.0550	2.0525
util living area												
	0.8890	0.8726	0.8326	0.7585	0.6471	0.4837	0.3629	0.3679	0.5773	0.7572	0.8526	0.8949 (86)
MIT	18.5372	18.7290	19.1965	19.8115	20.3823	20.7763	20.9167	20.9174	20.6599	20.0526	19.2567	18.5372 (87)
Th 2	19.9302	19.9375	19.9398	19.9465	19.9465	19.9487	19.9487	19.9507	19.9507	19.9443	19.9443	19.9421 (88)
util rest of house												
	0.8761	0.8580	0.8125	0.7277	0.5971	0.4064	0.2600	0.2606	0.5023	0.7176	0.8324	0.8825 (89)
MIT 2	16.7266	17.0000	17.6613	18.5188	19.2846	19.7641	19.9052	19.9091	19.6462	18.8656	17.7592	16.7318 (90)
Living area fraction									f _{LA} = Living area / (4)			0.1678 (91)
MIT	17.0305	17.2901	17.9189	18.7357	19.4688	19.9339	20.0749	20.0783	19.8163	19.0648	18.0105	17.0348 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.8805	17.1401	17.7689	18.5857	19.3188	19.7839	19.9249	19.9283	19.6663	18.9148	17.8605	16.8848 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8248	0.8056	0.7594	0.6796	0.5630	0.3932	0.2575	0.2581	0.4793	0.6702	0.7794	0.8323 (94)
Useful gains	528.9578	549.1149	557.7479	539.8013	458.0502	327.9136	201.2521	192.0731	330.1665	427.3905	478.9779	509.5143 (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	1086.0922	1064.2541	968.2430	810.2255	593.7759	370.0029	211.9544	202.3037	396.0201	633.0539	867.1103	1063.3562 (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	414.5080	346.1735	305.4084	194.7055	100.9799	0.0000	0.0000	0.0000	0.0000	153.0136	279.4553	412.0584 (98)
Space heating												2206.3026 (98)
Space heating per m2												26.9653 (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 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												2446.0117	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	414.5080	346.1735	305.4084	194.7055	100.9799	0.0000	0.0000	0.0000	0.0000	153.0136	279.4553	412.0584	(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)	459.5432	383.7844	338.5902	215.8597	111.9511	0.0000	0.0000	0.0000	0.0000	169.6381	309.8174	456.8275	(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	87.0535	86.9468	86.5278	85.5459	83.4608	76.4000	76.4000	76.4000	76.4000	84.5964	86.2681	76.4000	(216)
Fuel for water heating, kWh/month	119.1159	104.0193	108.3984	98.1025	97.8128	93.8672	89.9191	101.2456	101.8344	104.7393	109.3252	115.3874	(219)
Water heating fuel used												1243.7671	(219)
Annual totals kWh/year													
Space heating fuel - main system												2446.0117	(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												2212.7289	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2446.0117	7.6100	186.1415 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1243.7671	7.6100	94.6507 (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			-73.2749 (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	2446.0117	0.2160	528.3385 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1243.7671	0.2160	268.6537 (264)
Space and water heating			796.9922 (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			30.4033 (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	2446.0117	1.2200	2984.1343 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1243.7671	1.2200	1517.3959 (264)
Space and water heating			4501.5302 (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			-33.0131 (272)
Primary energy kWh/m2/year			-0.4035 (273)

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Built)

Property Reference	015 - PRJ013014	Issued on Date	02/05/2024
Assessment Reference	015	Prop Type Ref	2B
Property	11 Deeble Way, Netley Abbey, Southampton, SO31 5JP		
SAP Rating	85 B	DER	15.18
Environmental	88 B	TER	18.52
CO ₂ Emissions (t/year)	1.04	% DER<TER	18.06
General Requirements Compliance	Pass	DFEE	45.81
		TFEE	51.59
		% DFEE<TFEE	11.20
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)	18.52	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	15.18	kgCO ₂ /m ²	Pass
	-3.34 (-18.0%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	51.59	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	45.81	kWh/m ² /yr	
	-5.8 (-11.2%)	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	1.36 (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	4.67 (measured in this dwelling)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Built)

Main heating system

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

Pass

Secondary heating system

None

5 Cylinder insulation

Hot water storage

No cylinder

6 Controls

Space heating controls

Time and temperature zone control

Pass

Hot water controls

No cylinder

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100 %

Minimum

75 %

Pass

8 Mechanical ventilation

Not applicable

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Southern England)

Slight

Pass

Based on:

Overshading

Average

Windows facing North East

6.36 m², No overhang

Windows facing South West

2.72 m², No overhang

Air change rate

4.67 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

4.67 (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