

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

Property Reference	051 - PRJ013014	Issued on Date	21/10/2024
Assessment Reference	051	Prop Type Ref	3B
Property	10 Erwood Close, Netley Abbey, Southampton, SO31 5TJ		

SAP Rating	85 B	DER	14.33	TER	17.42
Environmental	88 B	% DER<TER	17.75		
CO ₂ Emissions (t/year)	1.13	DFEE	44.45	TTEE	49.99
General Requirements Compliance	Pass	% DFEE<TFEE	11.08		

Assessor Details	Mr. Christopher Nicholls, Briary Energy Limited, Tel: 0203 397 1373, chris@briaryenergy.co.uk	Assessor ID	U903-0001
------------------	---	-------------	-----------

Client	
--------	--

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	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					4.7200
Infiltration rate					0.3635 (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) =	0.3362 (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	0.4119	0.3867	0.3783	0.3531	0.3531	0.3447	0.3447	0.3362	0.3362	0.3615	0.3615	0.3699 (22b)
Effective ac	0.5848	0.5748	0.5715	0.5623	0.5623	0.5594	0.5594	0.5565	0.5565	0.5653	0.5653	0.5684 (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)
Fir - 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/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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	45.4074	44.6256	44.3759	43.6600	43.6600	43.4323	43.4323	43.2101	43.2101	43.8931	43.8931	44.1318	(38)
Heat transfer coeff	109.3344	108.5526	108.3029	107.5869	107.5869	107.3593	107.3593	107.1371	107.1371	107.8201	107.8201	108.0588	(39)
Average = Sum(39)m / 12 =												107.8380	(39)
HLP	1.1594	1.1511	1.1485	1.1409	1.1409	1.1385	1.1385	1.1361	1.1361	1.1434	1.1434	1.1459	(40)
HLP (average)												1.1436	(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		
Energy conte	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 content (annual)	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)	
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)	
RHI water heating demand														
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	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m	160.8075	160.8075	160.8075	160.8075	160.8075	160.8075	160.8075	160.8075	160.8075	160.8075	160.8075	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			
East				3.5460	25.1733		0.7300		0.7200		0.7700	32.5137 (76)			
West				7.7170	25.1733		0.7300		0.7200		0.7700	70.7582 (80)			
Solar gains				103.2719	171.8521	287.2129	420.8031	485.2685	548.1054	504.4876	452.0497	351.5621	222.6264	128.3464	83.4773 (83)
Total gains				714.2424	777.5949	868.5486	964.5677	990.6022	1019.3887	956.2346	913.1435	834.6313	743.4902	690.9541	677.6267 (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	15.6023	15.7146	15.7509	15.8557	15.8557	15.8893	15.8893	15.9223	15.9223	15.8214	15.8214	15.7865		
alpha	2.0402	2.0476	2.0501	2.0570	2.0570	2.0593	2.0593	2.0615	2.0615	2.0548	2.0548	2.0524		
util living area	0.8908	0.8702	0.8210	0.7360	0.6202	0.4558	0.3388	0.3427	0.5515	0.7469	0.8530	0.8977	(86)	
MIT	18.5253	18.7456	19.2550	19.8859	20.4329	20.8004	20.9269	20.9279	20.6890	20.0798	19.2542	18.5161	(87)	
Th 2	19.9526	19.9593	19.9614	19.9676	19.9676	19.9695	19.9695	19.9714	19.9714	19.9656	19.9656	19.9635	(88)	
util rest of house	0.8784	0.8556	0.8005	0.7045	0.5707	0.3823	0.2433	0.2433	0.4787	0.7075	0.8333	0.8858	(89)	
MIT 2	16.7244	17.0374	17.7555	18.6306	19.3603	19.8044	19.9308	19.9346	19.6925	18.9153	17.7701	16.7162	(90)	
Living area fraction									fLA = Living area / (4) =			0.1592	(91)	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

MIT	17.0110	17.3093	17.9942	18.8304	19.5310	19.9629	20.0894	20.0927	19.8511	19.1007	18.0064	17.0027 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.8610	17.1593	17.8442	18.6804	19.3810	19.8129	19.9394	19.9427	19.7011	18.9507	17.8564	16.8527 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8270	0.8027	0.7472	0.6580	0.5390	0.3703	0.2403	0.2403	0.4573	0.6604	0.7798	0.8357 (94)	
Useful gains	590.6815	624.1910	648.9607	634.6941	533.9073	377.4617	229.7818	219.4364	381.7116	491.0026	538.7931	566.2777 (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	1220.2835	1200.5195	1098.6469	923.1425	675.7531	420.0857	240.4203	229.5612	450.0979	717.0778	976.4583	1194.3381 (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	468.4238	387.2928	334.5665	207.6829	105.5333	0.0000	0.0000	0.0000	0.0000	168.2000	315.1190	467.2769 (98)	
Space heating												2454.0951 (98)	
RHI space heating demand												2454 (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	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					4.7200
Infiltration rate					0.3635 (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) =	0.3362 (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	0.4287	0.4203	0.4119	0.3699	0.3615	0.3194	0.3194	0.3110	0.3362	0.3615	0.3783	0.3951 (22b)
Effective ac	0.5919	0.5883	0.5848	0.5684	0.5653	0.5510	0.5510	0.5484	0.5565	0.5653	0.5715	0.5780 (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/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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	45.9560	45.6790	45.4074	44.1318	43.8931	42.7821	42.7821	42.5764	43.2101	43.8931	44.3759	44.8807 (38)
Heat transfer coeff	109.8830	109.6060	109.3344	108.0588	107.8201	106.7091	106.7091	106.5034	107.1371	107.8201	108.3029	108.8077 (39)
Average = Sum(39)m / 12 =												108.0576 (39)
HLP	1.1652	1.1623	1.1594	1.1459	1.1434	1.1316	1.1316	1.1294	1.1361	1.1434	1.1485	1.1538 (40)
HLP (average)												1.1459 (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	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												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

	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	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)
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)
												1073.7206 (64)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	160.8075	160.8075	160.8075	160.8075	160.8075	160.8075	160.8075	160.8075	160.8075	160.8075	160.8075	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			
East			3.5460	19.6403		0.7300	0.7200	0.7700	25.3673 (76)			
West			7.7170	19.6403		0.7300	0.7200	0.7700	55.2058 (80)			
Solar gains	80.5731	157.6180	259.5745	378.5739	463.9565	474.9421	452.1642	388.4024	301.8959	187.0271	100.4652	66.2594 (83)
Total gains	691.5436	763.3609	840.9102	922.3385	969.2902	946.2253	903.9113	849.4962	784.9651	707.8908	663.0729	660.4088 (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	15.5244	15.5636	15.6023	15.7865	15.8214	15.9861	15.9861	16.0170	15.9223	15.8214	15.7509	15.6778	
alpha	2.0350	2.0376	2.0402	2.0524	2.0548	2.0657	2.0657	2.0678	2.0615	2.0548	2.0501	2.0452	
util living area	0.9098	0.8884	0.8493	0.7804	0.6840	0.5597	0.4449	0.4808	0.6530	0.8101	0.8865	0.9166	(86)
MIT	18.1284	18.4093	18.9201	19.5883	20.1831	20.6294	20.8372	20.8028	20.4532	19.6827	18.7986	18.0738	(87)
Th 2	19.9479	19.9503	19.9526	19.9635	19.9656	19.9751	19.9751	19.9769	19.9714	19.9656	19.9614	19.9571	(88)
util rest of house	0.9000	0.8763	0.8325	0.7547	0.6440	0.4980	0.3604	0.3969	0.5965	0.7824	0.8723	0.9076	(89)
MIT 2	16.1546	16.5545	17.2798	18.2201	19.0325	19.6152	19.8541	19.8229	19.4075	18.3719	17.1216	16.0795	(90)
Living area fraction									fLA = Living area / (4) =			0.1592	(91)
MIT	16.4688	16.8497	17.5409	18.4379	19.2156	19.7766	20.0106	19.9789	19.5739	18.5805	17.3886	16.3969	(92)
Temperature adjustment												-0.1500	
adjusted MIT	16.3188	16.6997	17.3909	18.2879	19.0656	19.6266	19.8606	19.8289	19.4239	18.4305	17.2386	16.2469	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	588.8173	629.5521	654.7500	649.1519	585.2070	449.1586	316.4688	325.9043	440.9741	516.5965	544.1421	568.3550	(94)
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	1320.6587	1293.3191	1190.7476	1014.4469	794.1602	536.3876	347.9330	365.1863	570.3876	844.2866	1098.0379	1310.7972	(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	544.4900	446.0515	398.7823	263.0124	155.4611	0.0000	0.0000	0.0000	0.0000	243.8014	398.8050	552.3770	(98)
Space heating												3002.7807	(98)
Space heating per m2												(98) / (4) =	31.8428 (99)

8c. Space cooling requirement

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													3329.0252 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	544.4900	446.0515	398.7823	263.0124	155.4611	0.0000	0.0000	0.0000	0.0000	243.8014	398.8050	552.3770	(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)	603.6475	494.5138	442.1089	291.5880	172.3516	0.0000	0.0000	0.0000	0.0000	270.2898	442.1341	612.3914	(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	87.5873	87.4519	87.1092	86.3152	84.7890	76.4000	76.4000	76.4000	76.4000	85.9405	87.0960	76.4000	(216)
Fuel for water heating, kWh/month	122.9692	107.4245	111.9096	101.1218	100.1713	97.7010	93.6635	105.4201	106.0170	107.2775	112.5507	119.0740	(219)
Water heating fuel used												1285.3001	(219)
Annual totals kWh/year													
Space heating fuel - main system												3329.0252	(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												5118.3333	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3329.0252	3.4800	115.8501 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1285.3001	3.4800	44.7284 (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			347.0572 (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] =	1.0464 (257)
SAP value		85.4027
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	3329.0252	0.2160	719.0694 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1285.3001	0.2160	277.6248 (264)
Space and water heating			996.6943 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	429.0080	0.5190	222.6552 (268)
Total kg/year			1258.2744 (272)
CO2 emissions per m2			13.3400 (273)
EI value			87.8960
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	$3.48 / 0.8330 = 4.178$, stars = 5
Water heating environmental impact	$0.216 / 0.8330 = 0.2593$, 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	=	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							4.7200					
Infiltration rate							0.3635	(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) =	0.3362 (21)				
Wind speed	Jan 4.9000	Feb 4.6000	Mar 4.5000	Apr 4.2000	May 4.2000	Jun 4.1000	Jul 4.1000	Aug 4.0000	Sep 4.0000	Oct 4.3000	Nov 4.3000	Dec 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	0.4119	0.3867	0.3783	0.3531	0.3531	0.3447	0.3447	0.3362	0.3362	0.3615	0.3615	0.3699 (22b)
Effective ac	0.5848	0.5748	0.5715	0.5623	0.5623	0.5594	0.5594	0.5565	0.5565	0.5653	0.5653	0.5684 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	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, m2)			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)													
(38)m	Jan 45.4074	Feb 44.6256	Mar 44.3759	Apr 43.6600	May 43.6600	Jun 43.4323	Jul 43.4323	Aug 43.2101	Sep 43.2101	Oct 43.8931	Nov 43.8931	Dec 44.1318	(38)
Heat transfer coeff	109.3344	108.5526	108.3029	107.5869	107.5869	107.3593	107.3593	107.1371	107.1371	107.8201	107.8201	108.0588	(39)
Average = Sum(39)m / 12 =												107.8380	(39)
HLP	Jan 1.1594	Feb 1.1511	Mar 1.1485	Apr 1.1409	May 1.1409	Jun 1.1385	Jul 1.1385	Aug 1.1361	Sep 1.1361	Oct 1.1434	Nov 1.1434	Dec 1.1459	(40)
HLP (average)												1.1436	(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 107.6383	Feb 103.7242	Mar 99.8100	Apr 95.8959	May 91.9818	Jun 88.0677	Jul 88.0677	Aug 91.9818	Sep 95.8959	Oct 99.8100	Nov 103.7242	Dec 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	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)
												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)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	160.8075	160.8075	160.8075	160.8075	160.8075	160.8075	160.8075	160.8075	160.8075	160.8075	160.8075	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)

[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			
East				3.5460	25.1733	0.7300		0.7200	0.7700		70.5137 (76)	
West				7.7170	25.1733	0.7300		0.7200	0.7700		32.7582 (80)	
Solar gains	103.2719	171.8521	287.2129	420.8031	485.2685	548.1054	504.4876	452.0497	351.5621	222.6264	128.3464	83.4773 (83)
Total gains	714.2424	777.5949	868.5486	964.5677	990.6022	1019.3887	956.2346	913.1435	834.6313	743.4902	690.9541	677.6267 (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	15.6023	15.7146	15.7509	15.8557	15.8557	15.8893	15.8893	15.9223	15.9223	15.8214	15.8214	15.7865
alpha	2.0402	2.0476	2.0501	2.0570	2.0570	2.0593	2.0593	2.0615	2.0615	2.0548	2.0548	2.0524
util living area	0.8908	0.8702	0.8210	0.7360	0.6202	0.4558	0.3388	0.3427	0.5515	0.7469	0.8530	0.8977 (86)
MIT	18.5253	18.7456	19.2550	19.8859	20.4329	20.8004	20.9269	20.9279	20.6890	20.0798	19.2542	18.5161 (87)
Th 2	19.9526	19.9593	19.9614	19.9676	19.9676	19.9695	19.9695	19.9714	19.9714	19.9656	19.9656	19.9635 (88)
util rest of house	0.8784	0.8556	0.8005	0.7045	0.5707	0.3823	0.2433	0.2433	0.4787	0.7075	0.8333	0.8858 (89)
MIT 2	16.7244	17.0374	17.7555	18.6306	19.3603	19.8044	19.9308	19.9346	19.6925	18.9153	17.7701	16.7162 (90)
Living area fraction												0.1592 (91)
MIT	17.0110	17.3093	17.9942	18.8304	19.5310	19.9629	20.0894	20.0927	19.8511	19.1007	18.0064	17.0027 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.8610	17.1593	17.8442	18.6804	19.3810	19.8129	19.9394	19.9427	19.7011	18.9507	17.8564	16.8527 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8270	0.8027	0.7472	0.6580	0.5390	0.3703	0.2403	0.2403	0.4573	0.6604	0.7798	0.8357 (94)
Useful gains	590.6815	624.1910	648.9607	634.6941	533.9073	377.4617	229.7818	219.4364	381.7116	491.0026	538.7931	566.2777 (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	1220.2835	1200.5195	1098.6469	923.1425	675.7531	420.0857	240.4203	229.5612	450.0979	717.0778	976.4583	1194.3381 (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	468.4238	387.2928	334.5665	207.6829	105.5333	0.0000	0.0000	0.0000	0.0000	168.2000	315.1190	467.2769 (98)
Space heating												2454.0951 (98)
Space heating per m2												26.0243 (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												2720.7263 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	468.4238	387.2928	334.5665	207.6829	105.5333	0.0000	0.0000	0.0000	0.0000	168.2000	315.1190	467.2769 (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)	519.3169	429.3711	370.9163	230.2471	116.9992	0.0000	0.0000	0.0000	0.0000	186.4745	349.3558	518.0453 (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	87.2536	87.1278	86.6678	85.6235	83.4763	76.4000	76.4000	76.4000	76.4000	84.7782	86.4931	76.4000 (216)
Fuel for water heating, kWh/month	123.4394	107.8241	112.4796	101.9387	101.7465	97.7010	93.6635	105.4201	106.0170	108.7483	113.3353	119.5688 (219)
Water heating fuel used												1291.8822 (219)
Annual totals kWh/year												
Space heating fuel - main system												2720.7263 (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												4516.6165 (238)

10a. Fuel costs - using BEDF prices (553)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2720.7263	5.9600	162.1553 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1291.8822	5.9600	76.9962 (247)
Pumps and fans for heating	75.0000	25.0500	18.7875 (249)
Energy for lighting	429.0080	25.0500	107.4665 (250)
Additional standing charges			112.0000 (251)
Total energy cost			477.4055 (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	2720.7263	0.2160	587.6769 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1291.8822	0.2160	279.0466 (264)
Space and water heating			866.7234 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	429.0080	0.5190	222.6552 (268)
Total kg/year			1128.3036 (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	2720.7263	1.2200	3319.2861 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1291.8822	1.2200	1576.0963 (264)
Space and water heating			4895.3823 (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			6442.6870 (272)
Primary energy kWh/m2/year			68.3212 (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	-£ 488	-1010 kg (89.5%)

Measures omitted - SAP change or cost saving too small:

N Solar water heating	+ 0.9	-£ 35	-148 kg (13.1%)
-----------------------	-------	-------	-----------------

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar photovoltaic panels	£488 10.71 kg/m ²	A 95	A 97
Total Savings	£488 10.71 kg/m ²		
Potential energy efficiency rating:		A 95	
Potential environmental impact rating:			A 97

Fuel prices for cost data on this page from database revision number 553 TEST (30 Sep 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	£126	£126	£0
Mains gas	£351	£351	£0
Space heating	£293	£293	£0
Water heating	£77	£77	£0
Lighting	£107	£107	£0
Generated (PV)	-£0	-£488	£488
Total cost of fuels	£477	-£11	£488
Total cost of uses	£477	-£11	£488
Delivered energy	48 kWh/m ²	27 kWh/m ²	21 kWh/m ²
Carbon dioxide emissions	1.1 tonnes	0.1 tonnes	1.0 tonnes
CO2 emissions per m ²	12 kg/m ²	1 kg/m ²	11 kg/m ²
Primary energy	68 kWh/m ²	5 kWh/m ²	63 kWh/m ²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	47.1500 (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					4.7200
Infiltration rate					0.3635 (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) =	0.3362 (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	0.4287	0.4203	0.4119	0.3699	0.3615	0.3194	0.3194	0.3110	0.3362	0.3615	0.3783	0.3951 (22b)
Effective ac	0.5919	0.5883	0.5848	0.5684	0.5653	0.5510	0.5510	0.5484	0.5565	0.5653	0.5715	0.5780 (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/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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	45.9560	45.6790	45.4074	44.1318	43.8931	42.7821	42.7821	42.5764	43.2101	43.8931	44.3759	44.8807 (38)
Heat transfer coeff	109.8830	109.6060	109.3344	108.0588	107.8201	106.7091	106.7091	106.5034	107.1371	107.8201	108.3029	108.8077 (39)
Average = Sum(39)m / 12 =												108.0576 (39)
HLP	1.1652	1.1623	1.1594	1.1459	1.1434	1.1316	1.1316	1.1294	1.1361	1.1434	1.1485	1.1538 (40)
HLP (average)												1.1459 (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	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)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	160.8075	160.8075	160.8075	160.8075	160.8075	160.8075	160.8075	160.8075	160.8075	160.8075	160.8075	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)

[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					
East				3.5460	19.6403	0.7300	0.7200	0.7700	25.3673				
West				7.7170	19.6403	0.7300	0.7200	0.7700	55.2058				
Solar gains	80.5731	157.6180	259.5745	378.5739	463.9565	474.9421	452.1642	388.4024	301.8959	187.0271	100.4652	66.2594	(83)
Total gains	691.5436	763.3609	840.9102	922.3385	969.2902	946.2253	903.9113	849.4962	784.9651	707.8908	663.0729	660.4088	(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	15.5244	15.5636	15.6023	15.7865	15.8214	15.9861	15.9861	16.0170	15.9223	15.8214	15.7509	15.6778
alpha	2.0350	2.0376	2.0402	2.0524	2.0548	2.0657	2.0657	2.0678	2.0615	2.0548	2.0501	2.0452
util living area												
	0.9098	0.8884	0.8493	0.7804	0.6840	0.5597	0.4449	0.4808	0.6530	0.8101	0.8865	0.9166 (86)
MIT	18.1284	18.4093	18.9201	19.5883	20.1831	20.6294	20.8372	20.8028	20.4532	19.6827	18.7986	18.0738 (87)
Th 2	19.9479	19.9503	19.9526	19.9635	19.9656	19.9751	19.9751	19.9769	19.9714	19.9656	19.9614	19.9571 (88)
util rest of house												
	0.9000	0.8763	0.8325	0.7547	0.6440	0.4980	0.3604	0.3969	0.5965	0.7824	0.8723	0.9076 (89)
MIT 2	16.1546	16.5545	17.2798	18.2201	19.0325	19.6152	19.8541	19.8229	19.4075	18.3719	17.1216	16.0795 (90)
Living area fraction												
MIT	16.4688	16.8497	17.5409	18.4379	19.2156	19.7766	20.0106	19.9789	19.5739	18.5805	17.3886	16.3969 (92)
Temperature adjustment												
adjusted MIT	16.3188	16.6997	17.3909	18.2879	19.0656	19.6266	19.8606	19.8289	19.4239	18.4305	17.2386	16.2500 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8515	0.8247	0.7786	0.7038	0.6037	0.4747	0.3501	0.3836	0.5618	0.7298	0.8206	0.8606 (94)
Useful gains	588.8173	629.5521	654.7500	649.1519	585.2070	449.1586	316.4688	325.9043	440.9741	516.5965	544.1421	568.3550 (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	1320.6587	1293.3191	1190.7476	1014.4469	794.1602	536.3876	347.9330	365.1863	570.3876	844.2866	1098.0379	1310.7972 (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	544.4900	446.0515	398.7823	263.0124	155.4611	0.0000	0.0000	0.0000	0.0000	243.8014	398.8050	552.3770 (98)
Space heating												3002.7807 (98)
Space heating per m2											(98) / (4) =	31.8428 (99)

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												3329.0252	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	544.4900	446.0515	398.7823	263.0124	155.4611	0.0000	0.0000	0.0000	0.0000	243.8014	398.8050	552.3770	(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)	603.6475	494.5138	442.1089	291.5880	172.3516	0.0000	0.0000	0.0000	0.0000	270.2898	442.1341	612.3914	(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	87.5873	87.4519	87.1092	86.3152	84.7890	76.4000	76.4000	76.4000	76.4000	85.9405	87.0960	76.4000	(216)
Fuel for water heating, kWh/month	122.9692	107.4245	111.9096	101.1218	100.1713	97.7010	93.6635	105.4201	106.0170	107.2775	112.5507	119.0740	(219)
Water heating fuel used												1285.3001	(219)
Annual totals kWh/year													
Space heating fuel - main system												3329.0252	(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												3391.0939	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3329.0252	3.4800	115.8501 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1285.3001	3.4800	44.7284 (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			119.2343 (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] =	0.3595 (257)
SAP value	94.9850	
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	3329.0252	0.2160	719.0694 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1285.3001	0.2160	277.6248 (264)
Space and water heating			996.6943 (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			361.8372 (272)
CO2 emissions per m2			3.8400 (273)
EI value			96.5193
EI rating			97
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					4.7200
Infiltration rate					0.3635 (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) =	0.3362 (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	0.4119	0.3867	0.3783	0.3531	0.3531	0.3447	0.3447	0.3362	0.3362	0.3615	0.3615	0.3699 (22b)
Effective ac	0.5848	0.5748	0.5715	0.5623	0.5623	0.5594	0.5594	0.5565	0.5565	0.5653	0.5653	0.5684 (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/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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	45.4074	44.6256	44.3759	43.6600	43.6600	43.4323	43.4323	43.2101	43.2101	43.8931	43.8931	44.1318 (38)
Heat transfer coeff	109.3344	108.5526	108.3029	107.5869	107.5869	107.3593	107.3593	107.1371	107.1371	107.8201	107.8201	108.0588 (39)
Average = Sum(39)m / 12 =												107.8380 (39)
HLP	1.1594	1.1511	1.1485	1.1409	1.1409	1.1385	1.1385	1.1361	1.1361	1.1434	1.1434	1.1459 (40)
HLP (average)												1.1436 (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	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												

[illegible]

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	160.8075	160.8075	160.8075	160.8075	160.8075	160.8075	160.8075	160.8075	160.8075	160.8075	160.8075	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)

[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			
East				3.5460	25.1733	0.7300		0.7200	0.7700		70.5137 (76)	
West				7.7170	25.1733	0.7300		0.7200	0.7700		32.7582 (80)	
Solar gains	103.2719	171.8521	287.2129	420.8031	485.2685	548.1054	504.4876	452.0497	351.5621	222.6264	128.3464	83.4773 (83)
Total gains	714.2424	777.5949	868.5486	964.5677	990.6022	1019.3887	956.2346	913.1435	834.6313	743.4902	690.9541	677.6267 (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	15.6023	15.7146	15.7509	15.8557	15.8557	15.8893	15.8893	15.9223	15.9223	15.8214	15.8214	15.7865
alpha	2.0402	2.0476	2.0501	2.0570	2.0570	2.0593	2.0593	2.0615	2.0615	2.0548	2.0548	2.0524
util living area	0.8908	0.8702	0.8210	0.7360	0.6202	0.4558	0.3388	0.3427	0.5515	0.7469	0.8530	0.8977 (86)
MIT	18.5253	18.7456	19.2550	19.8859	20.4329	20.8004	20.9269	20.9279	20.6890	20.0798	19.2542	18.5161 (87)
Th 2	19.9526	19.9593	19.9614	19.9676	19.9676	19.9695	19.9695	19.9714	19.9714	19.9656	19.9656	19.9635 (88)
util rest of house	0.8784	0.8556	0.8005	0.7045	0.5707	0.3823	0.2433	0.2433	0.4787	0.7075	0.8333	0.8858 (89)
MIT 2	16.7244	17.0374	17.7555	18.6306	19.3603	19.8044	19.9308	19.9346	19.6925	18.9153	17.7701	16.7162 (90)
Living area fraction												0.1592 (91)
MIT	17.0110	17.3093	17.9942	18.8304	19.5310	19.9629	20.0894	20.0927	19.8511	19.1007	18.0064	17.0027 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.8610	17.1593	17.8442	18.6804	19.3810	19.8129	19.9394	19.9427	19.7011	18.9507	17.8564	16.8527 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8270	0.8027	0.7472	0.6580	0.5390	0.3703	0.2403	0.2403	0.4573	0.6604	0.7798	0.8357 (94)
Useful gains	590.6815	624.1910	648.9607	634.6941	533.9073	377.4617	229.7818	219.4364	381.7116	491.0026	538.7931	566.2777 (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												
	1220.2835	1200.5195	1098.6469	923.1425	675.7531	420.0857	240.4203	229.5612	450.0979	717.0778	976.4583	1194.3381 (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												
	468.4238	387.2928	334.5665	207.6829	105.5333	0.0000	0.0000	0.0000	0.0000	168.2000	315.1190	467.2769 (98)
Space heating												2454.0951 (98)
Space heating per m2												26.0243 (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												2720.7263	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	468.4238	387.2928	334.5665	207.6829	105.5333	0.0000	0.0000	0.0000	0.0000	168.2000	315.1190	467.2769	(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)	519.3169	429.3711	370.9163	230.2471	116.9992	0.0000	0.0000	0.0000	0.0000	186.4745	349.3558	518.0453	(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	87.2536	87.1278	86.6678	85.6235	83.4763	76.4000	76.4000	76.4000	76.4000	84.7782	86.4931	76.4000	(216)
Fuel for water heating, kWh/month	123.4394	107.8241	112.4796	101.9387	101.7465	97.7010	93.6635	105.4201	106.0170	108.7483	113.3353	119.5688	(219)
Water heating fuel used												1291.8822	(219)
Annual totals kWh/year													
Space heating fuel - main system												2720.7263	(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												2570.1706	(238)

10a. Fuel costs - using BEDF prices (553)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2720.7263	5.9600	162.1553 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1291.8822	5.9600	76.9962 (247)
Pumps and fans for heating	75.0000	25.0500	18.7875 (249)
Energy for lighting	429.0080	25.0500	107.4665 (250)
Additional standing charges			112.0000 (251)
Energy saving/generation technologies			
PV Unit	-1946.4459	25.0500	-487.5847 (252)
Total energy cost			-10.1792 (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	2720.7263	0.2160	587.6769 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1291.8822	0.2160	279.0466 (264)
Space and water heating			866.7234 (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			118.0982 (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	2720.7263	1.2200	3319.2861 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1291.8822	1.2200	1576.0963 (264)
Space and water heating			4895.3823 (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			467.0980 (272)
Primary energy kWh/m2/year			4.9533 (273)

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Built)

Property Reference	051 - PRJ013014	Issued on Date	21/10/2024
Assessment Reference	051	Prop Type Ref	3B
Property	10 Erwood Close, Netley Abbey, Southampton, SO31 5TJ		
SAP Rating	85 B	DER	14.33
Environmental	88 B	TER	17.42
CO ₂ Emissions (t/year)	1.13	% DER<TER	17.75
General Requirements Compliance	Pass	DfEE	44.45
		TfEE	49.99
		% DfEE<TfEE	11.08
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)	17.42	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.33	kgCO ₂ /m ²	Pass
	-3.09 (-17.7%)	kgCO ₂ /m ²	

1b TfEE and DfEE

Target Fabric Energy Efficiency (TfEE)	49.99	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DfEE)	44.45	kWh/m ² /yr	
	-5.5 (-11.0%)	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	4.72 (measured in this dwelling)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Built)

Main heating system

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

Pass

Secondary heating system

None

5 Cylinder insulation

Hot water storage

No cylinder

6 Controls

Space heating controls

Time and temperature zone control

Pass

Hot water controls

No cylinder

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100

%

Minimum

75

%

Pass

8 Mechanical ventilation

Not applicable

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Southern England)

Slight

Pass

Based on:

Overshading

Average

Windows facing East

3.55 m², No overhang

Windows facing West

7.72 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

4.72 (measured in this dwelling)

Maximum

10.0

Pass

10 Key features

Party wall U-value

0.00

W/m²K

Roof U-value

0.08

W/m²K

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