

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

Property Reference	028 - PRJ013014	Issued on Date	28/03/2024
Assessment Reference	028	Prop Type Ref	B
Property	18 Deeble Way, Netley Way, Southampton, SO31 5JP		

SAP Rating	85 B	DER	14.82	TER	17.90
Environmental	87 B	% DER<TER	17.20		
CO ₂ Emissions (t/year)	1.38	DFEE	50.07	TFEE	58.19
General Requirements Compliance	Pass	% DFEE<TFEE	13.95		

Assessor Details	Mr. Christopher Nicholls, Briary Energy Limited, Tel: 0203 397 1373, chris@briaryenergy.co.uk	Assessor ID	4299-0004
------------------	---	-------------	-----------

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	55.9600 (1b)	x 2.3700 (2b)	= 132.6252 (1b) - (3b)
First floor	55.9600 (1c)	x 2.6200 (2c)	= 146.6152 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	111.9200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 279.2404 (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								5 * 10 =	50.0000 (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) =						50.0000	/ (5) =	0.1791 (8)			
Pressure test									Yes			
Measured/design AP50									4.4900			
Infiltration rate									0.4036 (18)			
Number of sides sheltered									0 (19)			
Shelter factor									(20) = 1 - [0.075 x (19)] =	1.0000 (20)		
Infiltration rate adjusted to include shelter factor									(21) = (18) x (20) =	0.4036 (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	0.4944	0.4641	0.4540	0.4237	0.4237	0.4136	0.4136	0.4036	0.4036	0.4338	0.4338	0.4439 (22b)
Effective ac	0.6222	0.6077	0.6031	0.5898	0.5898	0.5856	0.5856	0.5814	0.5814	0.5941	0.5941	0.5985 (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			1.9000	1.2000	2.2800		(26)
Half Glazed Door			2.0900	1.4000	2.9260		(26a)
Windows (Uw = 1.40)			17.4200	1.3258	23.0947		(27)
F1r - Ground			55.9640	0.1800	10.0735	75.6000	4230.8784 (28a)
W1 - Brick (Timber Frame)	151.1190	21.4090	129.7100	0.2100	27.2391	7.4000	959.8540 (29a)
Rf - Ins Joist	55.9640		55.9640	0.0800	4.4771	7.4000	414.1336 (30)
Total net area of external elements Aum(A, m ²)			263.0480				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	70.0904			(33)
Stud			100.9904			7.4000	747.3293 (32c)
Internal Floor			55.9640			7.4000	414.1336 (32d)
Internal Ceiling			55.9640			7.4000	414.1336 (32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		7180.4625 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							64.1571 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							19.3336 (36)
Total fabric heat loss						(33) + (36) =	89.4240 (37)

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

(38)m	Jan 57.3348	Feb 55.9982	Mar 55.5715	Apr 54.3474	May 54.3474	Jun 53.9582	Jul 53.9582	Aug 53.5783	Sep 53.5783	Oct 54.7461	Nov 54.7461	Dec 55.1541 (38)
Heat transfer coeff	146.7589	145.4223	144.9955	143.7715	143.7715	143.3822	143.3822	143.0023	143.0023	144.1701	144.1701	144.5781 (39)
Average = Sum(39) / 12 =												144.2006 (39)
HLP	Jan 1.3113	Feb 1.2993	Mar 1.2955	Apr 1.2846	May 1.2846	Jun 1.2811	Jul 1.2811	Aug 1.2777	Sep 1.2777	Oct 1.2882	Nov 1.2882	Dec 1.2918 (40)
HLP (average)												1.2884 (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												2.8259 (42)
Average daily hot water use (litres/day)												101.3145 (43)
Daily hot water use	Jan 111.4459	Feb 107.3933	Mar 103.3408	Apr 99.2882	May 95.2356	Jun 91.1830	Jul 91.1830	Aug 95.2356	Sep 99.2882	Oct 103.3408	Nov 107.3933	Dec 111.4459 (44)
Energy conte	165.2711	144.5471	149.1597	130.0410	124.7775	107.6735	99.7753	114.4936	115.8610	135.0249	147.3902	160.0562 (45)
Energy content (annual)										Total = Sum(45)m =		1594.0712 (45)
Distribution loss (46)m = 0.15 x (45)m	24.7907	21.6821	22.3740	19.5062	18.7166	16.1510	14.9663	17.1740	17.3792	20.2537	22.1085	24.0084 (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	0.6694	0.6089	0.6525	0.5810	0.5347	0.4418	0.4094	0.4907	0.5177	0.5906	0.6208	0.6483 (61)
Total heat required for water heating calculated for each month	165.9405	145.1560	149.8122	130.6221	125.3122	108.1153	100.1847	114.9843	116.3787	135.6155	148.0111	160.7045 (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	165.9405	145.1560	149.8122	130.6221	125.3122	108.1153	100.1847	114.9843	116.3787	135.6155	148.0111	160.7045 (64)
RHI water heating demand										Total per year (kWh/year) = Sum(64)m =		1600.8370 (64)
Heat gains from water heating, kWh/month	55.1200	48.2141	49.7587	43.3839	41.6222	35.9119	33.2776	38.1918	38.6532	45.0434	49.1625	53.3808 (65)

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

Metabolic gains (Table 5), Watts	Jan 169.5524	Feb 169.5524	Mar 169.5524	Apr 169.5524	May 169.5524	Jun 169.5524	Jul 169.5524	Aug 169.5524	Sep 169.5524	Oct 169.5524	Nov 169.5524	Dec 169.5524 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	63.7726	56.6423	46.0646	34.8738	26.0686	22.0082	23.7807	30.9110	41.4887	52.6794	61.4846	65.5450 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	409.3823	413.6304	402.9253	380.1355	351.3673	324.3293	306.2663	302.0182	312.7233	335.5132	364.2813	391.3193 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.7811	54.7811	54.7811	54.7811	54.7811	54.7811	54.7811	54.7811	54.7811	54.7811	54.7811	54.7811 (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)	-113.0349	-113.0349	-113.0349	-113.0349	-113.0349	-113.0349	-113.0349	-113.0349	-113.0349	-113.0349	-113.0349	-113.0349 (71)
Water heating gains (Table 5)	74.0860	71.7472	66.8800	60.2554	55.9438	49.8776	44.7280	51.3331	53.6850	60.5422	68.2812	71.7483 (72)
Total internal gains	661.5395	656.3185	630.1685	589.5633	547.6783	510.5137	489.0735	498.5608	522.1956	563.0334	608.3457	642.9112 (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					8.1710	25.1733	0.7300		0.7200		0.7700		74.9209 (76)
West					9.2460	25.1733	0.7300		0.7200		0.7700		84.7777 (80)

Solar gains	159.6987	265.7504	444.1435	650.7261	750.4148	847.5852	780.1350	699.0455	543.6524	344.2675	198.4736	129.0885	(83)
Total gains	821.2382	922.0689	1074.3119	1240.2894	1298.0931	1358.0990	1269.2085	1197.6063	1065.8480	907.3009	806.8193	771.9997	(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 13.5908	Feb 13.7157	Mar 13.7561	Apr 13.8732	May 13.8732	Jun 13.9109	Jul 13.9109	Aug 13.9478	Sep 13.9478	Oct 13.8349	Nov 13.8349	Dec 13.7958
alpha	1.9061	1.9144	1.9171	1.9249	1.9249	1.9274	1.9274	1.9299	1.9299	1.9223	1.9223	1.9197
util living area	0.9015	0.8780	0.8237	0.7317	0.6134	0.4484	0.3358	0.3429	0.5554	0.7574	0.8652	0.9086 (86)
MIT	18.1512	18.4174	19.0110	19.7365	20.3496	20.7653	20.9100	20.9098	20.6263	19.9155	18.9713	18.1435 (87)
Th 2	19.8320	19.8413	19.8443	19.8529	19.8529	19.8557	19.8557	19.8583	19.8583	19.8501	19.8501	19.8473 (88)
util rest of house	0.8892	0.8631	0.8019	0.6976	0.5596	0.3686	0.2312	0.2332	0.4759	0.7157	0.8454	0.8971 (89)
MIT 2	16.1686	16.5438	17.3734	18.3697	19.1776	19.6715	19.8125	19.8166	19.5369	18.6392	17.3379	16.1633 (90)
Living area fraction									fLA = Living area / (4) =			0.1892 (91)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

MIT	16.5436	16.8982	17.6832	18.6282	19.3993	19.8784	20.0201	20.0234	19.7430	18.8806	17.6469	16.5379 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.3936	16.7482	17.5332	18.4782	19.2493	19.7284	19.8701	19.8734	19.5930	18.7306	17.4969	16.3879 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8364	0.8076	0.7451	0.6484	0.5274	0.3590	0.2326	0.2348	0.4550	0.6649	0.7891	0.8459	(94)
Useful gains	686.8449	744.6440	800.4412	804.2563	684.6098	487.5349	295.2557	281.1627	484.9824	603.2496	636.6411	653.0566	(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													
	1569.3818	1548.4888	1425.7642	1204.5494	884.0972	548.9276	311.1473	296.5007	585.3037	927.1033	1253.8271	1530.7745	(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													
	656.6075	540.1837	465.2403	288.2110	148.4186	0.0000	0.0000	0.0000	0.0000	240.9471	444.3739	653.0221	(98)
Space heating													3437.0042 (98)
RHI space heating demand													3437 (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	55.9600 (1b)	x 2.3700 (2b)	= 132.6252 (1b) - (3b)
First floor	55.9600 (1c)	x 2.6200 (2c)	= 146.6152 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	111.9200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 279.2404 (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					5 * 10 = 50.0000 (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)					50.0000 / (5) = 0.1791 (8)
Pressure test					Yes
Measured/design AP50					4.4900
Infiltration rate					0.4036 (18)
Number of sides sheltered					0 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.4036 (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												
Effective ac	0.5145	0.5044	0.4944	0.4439	0.4338	0.3834	0.3834	0.3733	0.4036	0.4338	0.4540	0.4742 (22b)
	0.6324	0.6272	0.6222	0.5985	0.5941	0.5735	0.5735	0.5697	0.5814	0.5941	0.6031	0.6124 (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			1.9000	1.2000	2.2800		(26)
Half Glazed Door			2.0900	1.4000	2.9260		(26a)
Windows (Uw = 1.40)			17.4200	1.3258	23.0947		(27)
Flr - Ground			55.9640	0.1800	10.0735	75.6000	4230.8784 (28a)
Wl - Brick (Timber Frame)	151.1190	21.4090	129.7100	0.2100	27.2391	7.4000	959.8540 (29a)
Rf - Ins Joist	55.9640		55.9640	0.0800	4.4771	7.4000	414.1336 (30)
Total net area of external elements Aum(A, m ²)			263.0480				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		70.0904		(33)
Stud			100.9904			7.4000	747.3293 (32c)
Internal Floor			55.9640			7.4000	414.1336 (32d)
Internal Ceiling			55.9640			7.4000	414.1336 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 7180.4625 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							64.1571 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							19.3336 (36)
Total fabric heat loss							(33) + (36) = 89.4240 (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	58.2728	57.7991	57.3348	55.1541	54.7461	52.8467	52.8467	52.4950	53.5783	54.7461	55.5715	56.4344 (38)
Heat transfer coeff	147.6968	147.2232	146.7589	144.5781	144.1701	142.2707	142.2707	141.9190	143.0023	144.1701	144.9955	145.8584 (39)
Average = Sum(39)m / 12 =												144.5762 (39)
HLP	1.3197	1.3154	1.3113	1.2918	1.2882	1.2712	1.2712	1.2680	1.2777	1.2882	1.2955	1.3032 (40)
HLP (average)												1.2918 (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												2.8259 (42)
Average daily hot water use (litres/day)												101.3145 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	111.4459	107.3933	103.3408	99.2882	95.2356	91.1830	91.1830	95.2356	99.2882	103.3408	107.3933	111.4459 (44)
Energy conte	165.2711	144.5471	149.1597	130.0410	124.7775	107.6735	99.7753	114.4936	115.8610	135.0249	147.3902	160.0562 (45)
Energy content (annual)										Total = Sum(45)m =		1594.0712 (45)
Distribution loss (46)m = 0.15 x (45)m												

Water storage loss:	24.7907	21.6821	22.3740	19.5062	18.7166	16.1510	14.9663	17.1740	17.3792	20.2537	22.1085	24.0084 (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	0.6694	0.6089	0.6525	0.5810	0.5347	0.4418	0.4094	0.4907	0.5177	0.5906	0.6208	0.6483 (61)
WWHRS	165.9405	145.1560	149.8122	130.6221	125.3122	108.1153	100.1847	114.9843	116.3787	135.6155	148.0111	160.7045 (62)
Total of WWHRS savings	-55.0538	-48.4415	-49.4402	-40.6697	-37.7584	-31.1459	-26.3543	-31.9108	-32.8442	-40.6077	-47.0466	-53.2138 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	-494.4869
Output from w/h								Solar input	(sum of months) =	Sum(63)m =		0.0000 (63)
	110.8867	96.7145	100.3720	89.9523	87.5538	76.9694	73.8304	83.0735	83.5345	95.0078	100.9645	107.4907 (64)
Heat gains from water heating, kWh/month								Total per year (kWh/year) =	Sum(64)m =			1106.3501 (64)
	55.1200	48.2141	49.7587	43.3839	41.6222	35.9119	33.2776	38.1918	38.6532	45.0434	49.1625	53.3808 (65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	169.5524	169.5524	169.5524	169.5524	169.5524	169.5524	169.5524	169.5524	169.5524	169.5524	169.5524	169.5524 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	63.7726	56.6423	46.0646	34.8738	26.0686	22.0082	23.7807	30.9110	41.4887	52.6794	61.4846	65.5450 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	409.3823	413.6304	402.9253	380.1355	351.3673	324.3293	306.2663	302.0182	312.7233	335.5132	364.2813	391.3193 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.7811	54.7811	54.7811	54.7811	54.7811	54.7811	54.7811	54.7811	54.7811	54.7811	54.7811	54.7811 (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)	-113.0349	-113.0349	-113.0349	-113.0349	-113.0349	-113.0349	-113.0349	-113.0349	-113.0349	-113.0349	-113.0349	-113.0349 (71)
Water heating gains (Table 5)	74.0860	71.7472	66.8800	60.2554	55.9438	49.8776	44.7280	51.3331	53.6850	60.5422	68.2812	71.7483 (72)
Total internal gains	661.5395	656.3185	630.1685	589.5633	547.6783	510.5137	489.0735	498.5608	522.1956	563.0334	608.3457	642.9112 (73)

[Jan]					Area	Solar flux		g	FF	Access	Gains	
					m2	Table 6a	W/m2	Specific data	Specific data	factor	W	
								or Table 6b	or Table 6c	Table 6d		
East					8.1710	19.6403		0.7300	0.7200	0.7700	58.4536 (76)	
West					9.2460	19.6403		0.7300	0.7200	0.7700	66.1439 (80)	
Solar gains	124.5975	243.7391	401.4036	585.4232	717.4581	734.4460	699.2226	600.6219	466.8490	289.2170	155.3584	102.4629 (80)
Total gains	786.1370	900.0576	1031.5721	1174.9865	1265.1364	1244.9598	1188.2961	1099.1827	989.0445	852.2504	763.7041	745.3741 (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	13.5045	13.5480	13.5908	13.7958	13.8349	14.0196	14.0196	14.0543	13.9478	13.8349	13.7561	13.6747
alpha	1.9003	1.9032	1.9061	1.9197	1.9223	1.9346	1.9346	1.9370	1.9299	1.9223	1.9171	1.9116
util living area	0.9195	0.8955	0.8524	0.7774	0.6767	0.5528	0.4417	0.4817	0.6579	0.8197	0.8973	0.9262 (86)
MIT	17.7119	18.0446	18.6365	19.4040	20.0732	20.5716	20.8051	20.7620	20.3544	19.4686	18.4646	17.6566 (87)
Th 2	19.8255	19.8288	19.8320	19.8473	19.8501	19.8635	19.8635	19.8660	19.8583	19.8501	19.8443	19.8383 (88)
util rest of house	0.9100	0.8833	0.8347	0.7497	0.6332	0.4858	0.3495	0.3900	0.5970	0.7909	0.8833	0.9175 (89)
MIT 2	15.5421	16.0121	16.8454	17.9154	18.8192	19.4630	19.7271	19.6899	19.2124	18.0313	16.6207	15.4669 (90)
Living area fraction									fLA = Living area / (4) =			0.1892 (91)
MIT	15.9526	16.3966	17.1842	18.1969	19.0564	19.6727	19.9310	19.8927	19.4284	18.3032	16.9695	15.8811 (92)
Temperature adjustment												-0.1500
adjusted MIT	15.8026	16.2466	17.0342	18.0469	18.9064	19.5227	19.7810	19.7427	19.2784	18.1532	16.8195	15.7311 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8609	0.8295	0.7774	0.6956	0.5915	0.4634	0.3421	0.3789	0.5605	0.7347	0.8300	0.8704 (94)
Useful gains	676.7756	746.6368	801.9732	817.2975	748.2291	576.8575	406.5699	416.5271	554.3134	626.1100	633.8739	648.7441 (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												
	1698.8915	1670.4782	1545.9838	1322.4481	1038.9453	700.3572	452.5673	474.3913	740.5269	1088.9434	1409.2844	1681.9068 (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												
	760.4543	620.8214	553.5439	363.7084	216.2407	0.0000	0.0000	0.0000	0.0000	344.3480	558.2955	768.6730 (98)
Space heating												4186.0853 (98)
Space heating per m2												(98) / (4) = 37.4025 (99)

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												4640.8928 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	760.4543	620.8214	553.5439	363.7084	216.2407	0.0000	0.0000	0.0000	0.0000	344.3480	558.2955	768.6730 (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)	843.0757	688.2721	613.6850	403.2244	239.7347	0.0000	0.0000	0.0000	0.0000	381.7606	618.9529	852.1874 (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	110.8867	96.7145	100.3720	89.9523	87.5538	76.9694	73.8304	83.0735	83.5345	95.0078	100.9645	107.4907 (64)
Efficiency of water heater (217)m	88.1732	88.0562	87.7666	87.0812	85.7368	76.4000	76.4000	76.4000	76.4000	86.8093	87.7720	76.4000 (216)
Fuel for water heating, kWh/month	125.7601	109.8328	114.3624	103.2971	102.1193	100.7453	96.6366	108.7349	109.3383	109.4443	115.0304	121.8101 (219)
Water heating fuel used												1317.1116 (219)
Annual totals kWh/year												
Space heating fuel - main system												4640.8928 (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)												450.4976 (232)
Total delivered energy for all uses												6483.5020 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	4640.8928	3.4800	161.5031 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1317.1116	3.4800	45.8355 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	450.4976	13.1900	59.4206 (250)
Additional standing charges			120.0000 (251)
Total energy cost			396.6517 (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] = 1.0616 (257)	
SAP value	85.1900	
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	4640.8928	0.2160	1002.4328 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1317.1116	0.2160	284.4961 (264)
Space and water heating			1286.9290 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	450.4976	0.5190	233.8082 (268)
Total kg/year			1559.6622 (272)
CO2 emissions per m2			13.9400 (273)
EI value			86.6814
EI rating			87 (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	$3.48 / 0.8377 = 4.154$, stars = 5
Water heating environmental impact	$0.216 / 0.8377 = 0.2578$, 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	55.9600 (1b)	x 2.3700 (2b)	= 132.6252 (1b) - (3b)
First floor	55.9600 (1c)	x 2.6200 (2c)	= 146.6152 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	111.9200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 279.2404 (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					5 * 10 = 50.0000 (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) =				50.0000 / (5) = 0.1791 (8)
Pressure test					Yes
Measured/design AP50					4.4900
Infiltration rate					0.4036 (18)
Number of sides sheltered					0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.4036 (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	0.4944	0.4641	0.4540	0.4237	0.4237	0.4136	0.4136	0.4036	0.4036	0.4338	0.4338	0.4439 (22b)
Effective ac	0.6222	0.6077	0.6031	0.5898	0.5898	0.5856	0.5856	0.5814	0.5814	0.5941	0.5941	0.5985 (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			1.9000	1.2000	2.2800		(26)
Half Glazed Door			2.0900	1.4000	2.9260		(26a)
Windows (Uw = 1.40)			17.4200	1.3258	23.0947		(27)
Flr - Ground			55.9640	0.1800	10.0735	75.6000	4230.8784 (28a)
Wl - Brick (Timber Frame)	151.1190	21.4090	129.7100	0.2100	27.2391	7.4000	959.8540 (29a)
Rf - Ins Joist	55.9640		55.9640	0.0800	4.4771	7.4000	414.1336 (30)
Total net area of external elements Aum(A, m ²)			263.0480				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		70.0904		(33)
Stud			100.9904			7.4000	747.3293 (32c)
Internal Floor			55.9640			7.4000	414.1336 (32d)
Internal Ceiling			55.9640			7.4000	414.1336 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 7180.4625 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							64.1571 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							19.3336 (36)
Total fabric heat loss							(33) + (36) = 89.4240 (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	57.3348	55.9982	55.5715	54.3474	54.3474	53.9582	53.9582	53.5783	53.5783	54.7461	54.7461	55.1541 (38)
Heat transfer coeff	146.7589	145.4223	144.9955	143.7715	143.7715	143.3822	143.3822	143.0023	143.0023	144.1701	144.1701	144.5781 (39)
Average = Sum(39)m / 12 =												144.2006 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3113	1.2993	1.2955	1.2846	1.2846	1.2811	1.2811	1.2777	1.2777	1.2882	1.2882	1.2918 (40)
HLP (average)												1.2884 (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												2.8259 (42)
Average daily hot water use (litres/day)												101.3145 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	111.4459	107.3933	103.3408	99.2882	95.2356	91.1830	91.1830	95.2356	99.2882	103.3408	107.3933	111.4459 (44)
Energy conte	165.2711	144.5471	149.1597	130.0410	124.7775	107.6735	99.7753	114.4936	115.8610	135.0249	147.3902	160.0562 (45)
Energy content (annual)										Total = Sum(45)m =		1594.0712 (45)
Distribution loss (46)m = 0.15 x (45)m												

	24.7907	21.6821	22.3740	19.5062	18.7166	16.1510	14.9663	17.1740	17.3792	20.2537	22.1085	24.0084 (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	0.6694	0.6089	0.6525	0.5810	0.5347	0.4418	0.4094	0.4907	0.5177	0.5906	0.6208	0.6483 (61)
Total heat required for water heating calculated for each month												
WWHRS	165.9405	145.1560	149.8122	130.6221	125.3122	108.1153	100.1847	114.9843	116.3787	135.6155	148.0111	160.7045 (62)
Total of WWHRS savings	-55.0538	-48.4415	-49.4402	-40.6697	-37.7584	-31.1459	-26.3543	-31.9108	-32.8442	-40.6077	-47.0466	-53.2138 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	-494.4869
Output from w/h								Solar input	(sum of months) =	Sum(63)m =		0.0000 (63)
	110.8867	96.7145	100.3720	89.9523	87.5538	76.9694	73.8304	83.0735	83.5345	95.0078	100.9645	107.4907 (64)
								Total per year (kWh/year) =	Sum(64)m =			1106.3501 (64)
Heat gains from water heating, kWh/month												
	55.1200	48.2141	49.7587	43.3839	41.6222	35.9119	33.2776	38.1918	38.6532	45.0434	49.1625	53.3808 (65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	169.5524	169.5524	169.5524	169.5524	169.5524	169.5524	169.5524	169.5524	169.5524	169.5524	169.5524	169.5524 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	63.7726	56.6423	46.0646	34.8738	26.0686	22.0082	23.7807	30.9110	41.4887	52.6794	61.4846	65.5450 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	409.3823	413.6304	402.9253	380.1355	351.3673	324.3293	306.2663	302.0182	312.7233	335.5132	364.2813	391.3193 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.7811	54.7811	54.7811	54.7811	54.7811	54.7811	54.7811	54.7811	54.7811	54.7811	54.7811	54.7811 (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)	-113.0349	-113.0349	-113.0349	-113.0349	-113.0349	-113.0349	-113.0349	-113.0349	-113.0349	-113.0349	-113.0349	-113.0349 (71)
Water heating gains (Table 5)	74.0860	71.7472	66.8800	60.2554	55.9438	49.8776	44.7280	51.3331	53.6850	60.5422	68.2812	71.7483 (72)
Total internal gains	661.5395	656.3185	630.1685	589.5633	547.6783	510.5137	489.0735	498.5608	522.1956	563.0334	608.3457	642.9112 (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
East	8.1710	25.1733	0.7300	0.7200	0.7700	74.9209 (76)
West	9.2460	25.1733	0.7300	0.7200	0.7700	84.7777 (80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8364	0.8076	0.7451	0.6484	0.5274	0.3590	0.2326	0.2348	0.4550	0.6649	0.7891	0.8459 (94)
Useful gains	686.8449	744.6440	800.4412	804.2563	684.6098	487.5349	295.2557	281.1627	484.9824	603.2496	636.6411	653.0566 (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	1569.3818	1548.4888	1425.7642	1204.5494	884.0972	548.9276	311.1473	296.5007	585.3037	927.1033	1253.8271	1530.7745 (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	656.6075	540.1837	465.2403	288.2110	148.4186	0.0000	0.0000	0.0000	0.0000	240.9471	444.3739	653.0221 (98)
Space heating												3437.0042 (98)
Space heating per m2											(98) / (4) =	30.7095 (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 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													3810.4260 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	656.6075	540.1837	465.2403	288.2110	148.4186	0.0000	0.0000	0.0000	0.0000	240.9471	444.3739	653.0221	(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)	727.9462	598.8733	515.7875	319.5244	164.5439	0.0000	0.0000	0.0000	0.0000	267.1254	492.6540	723.9713	(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	110.8867	96.7145	100.3720	89.9523	87.5538	76.9694	73.8304	83.0735	83.5345	95.0078	100.9645	107.4907	(64)
Efficiency of water heater (217)m	87.9059	87.7920	87.3985	86.4842	84.5346	76.4000	76.4000	76.4000	76.4000	85.8164	87.2812	76.4000	(216)
Fuel for water heating, kWh/month	126.1424	110.1633	114.8441	104.0102	103.5716	100.7453	96.6366	108.7349	109.3383	110.7105	115.6772	122.2117	(219)
Water heating fuel used												1322.7862	(219)
Annual totals kWh/year													
Space heating fuel - main system												3810.4260	(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)												450.4976	(232)
Total delivered energy for all uses												5658.7098	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3810.4260	7.6100	289.9734 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1322.7862	7.6100	100.6640 (247)
Pumps and fans for heating	75.0000	31.0800	23.3100 (249)
Energy for lighting	450.4976	31.0800	140.0146 (250)
Additional standing charges			105.0000 (251)
Total energy cost			658.9621 (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	3810.4260	0.2160	823.0520 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1322.7862	0.2160	285.7218 (264)
Space and water heating			1108.7738 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	450.4976	0.5190	233.8082 (268)
Total kg/year			1381.5071 (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	3810.4260	1.2200	4648.7197 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1322.7862	1.2200	1613.7992 (264)
Space and water heating			6262.5189 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	450.4976	3.0700	1383.0276 (268)
Primary energy kWh/year			7875.7965 (272)
Primary energy kWh/m2/year			70.3699 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 85
Current environmental impact rating: B 87

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	+ 8.5	-£ 605	-1010 kg (73.1%)

Measures omitted - SAP change or cost saving too small:

N Solar water heating	+ 0.8	-£ 47	-151 kg (10.9%)
-----------------------	-------	-------	-----------------

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar photovoltaic panels	£605	9.03 kg/m²	A 94
Total Savings	£605	9.03 kg/m²	A 94
Potential energy efficiency rating:		A 94	
Potential environmental impact rating:			A 94

Fuel prices for cost data on this page from database revision number 538 TEST (29 Feb 2024)
Recommendation texts revision number 4.9c (22 Feb 2014)

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

	Current	Potential	Saving
Electricity	£163	£163	£0
Mains gas	£496	£496	£0
Space heating	£418	£418	£0
Water heating	£101	£101	£0
Lighting	£140	£140	£0
Generated (PV)	-£0	-£605	£605
Total cost of fuels	£659	£54	£605
Total cost of uses	£659	£54	£605
Delivered energy	51 kWh/m²	33 kWh/m²	17 kWh/m²
Carbon dioxide emissions	1.4 tonnes	0.4 tonnes	1.0 tonnes
CO2 emissions per m²	12 kg/m²	3 kg/m²	9 kg/m²
Primary energy	70 kWh/m²	17 kWh/m²	53 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	55.9600 (1b)	x 2.3700 (2b)	= 132.6252 (1b) - (3b)
First floor	55.9600 (1c)	x 2.6200 (2c)	= 146.6152 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	111.9200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 279.2404 (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					5 * 10 = 50.0000 (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) =					50.0000 / (5) = 0.1791 (8)
Pressure test					Yes
Measured/design AP50					4.4900
Infiltration rate					0.4036 (18)
Number of sides sheltered					0 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.4036 (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												
Effective ac	0.5145	0.5044	0.4944	0.4439	0.4338	0.3834	0.3834	0.3733	0.4036	0.4338	0.4540	0.4742 (22b)
	0.6324	0.6272	0.6222	0.5985	0.5941	0.5735	0.5735	0.5697	0.5814	0.5941	0.6031	0.6124 (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			1.9000	1.2000	2.2800		(26)
Half Glazed Door			2.0900	1.4000	2.9260		(26a)
Windows (Uw = 1.40)			17.4200	1.3258	23.0947		(27)
Flr - Ground			55.9640	0.1800	10.0735	75.6000	4230.8784 (28a)
Wl - Brick (Timber Frame)	151.1190	21.4090	129.7100	0.2100	27.2391	7.4000	959.8540 (29a)
Rf - Ins Joist	55.9640		55.9640	0.0800	4.4771	7.4000	414.1336 (30)
Total net area of external elements Aum(A, m ²)			263.0480				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	70.0904		(33)
Stud			100.9904			7.4000	747.3293 (32c)
Internal Floor			55.9640			7.4000	414.1336 (32d)
Internal Ceiling			55.9640			7.4000	414.1336 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 7180.4625 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							64.1571 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							19.3336 (36)
Total fabric heat loss							(33) + (36) = 89.4240 (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	58.2728	57.7991	57.3348	55.1541	54.7461	52.8467	52.8467	52.4950	53.5783	54.7461	55.5715	56.4344 (38)
Heat transfer coeff	147.6968	147.2232	146.7589	144.5781	144.1701	142.2707	142.2707	141.9190	143.0023	144.1701	144.9955	145.8584 (39)
Average = Sum(39)m / 12 =												144.5762 (39)
HLP	1.3197	1.3154	1.3113	1.2918	1.2882	1.2712	1.2712	1.2680	1.2777	1.2882	1.2955	1.3032 (40)
HLP (average)												1.2918 (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												2.8259 (42)
Average daily hot water use (litres/day)												101.3145 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	111.4459	107.3933	103.3408	99.2882	95.2356	91.1830	91.1830	95.2356	99.2882	103.3408	107.3933	111.4459 (44)
Energy conte	165.2711	144.5471	149.1597	130.0410	124.7775	107.6735	99.7753	114.4936	115.8610	135.0249	147.3902	160.0562 (45)
Energy content (annual)										Total = Sum(45)m =		1594.0712 (45)
Distribution loss (46)m = 0.15 x (45)m												

	24.7907	21.6821	22.3740	19.5062	18.7166	16.1510	14.9663	17.1740	17.3792	20.2537	22.1085	24.0084 (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	0.6694	0.6089	0.6525	0.5810	0.5347	0.4418	0.4094	0.4907	0.5177	0.5906	0.6208	0.6483 (61)
Total heat required for water heating calculated for each month												
WWHRS	165.9405	145.1560	149.8122	130.6221	125.3122	108.1153	100.1847	114.9843	116.3787	135.6155	148.0111	160.7045 (62)
Total of WWHRS savings	-55.0538	-48.4415	-49.4402	-40.6697	-37.7584	-31.1459	-26.3543	-31.9108	-32.8442	-40.6077	-47.0466	-53.2138 eq.(G10) -494.4869
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)
	110.8867	96.7145	100.3720	89.9523	87.5538	76.9694	73.8304	83.0735	83.5345	95.0078	100.9645	107.4907 (64)
								Total per year (kWh/year) = Sum(64)m =				1106.3501 (64)
Heat gains from water heating, kWh/month												
	55.1200	48.2141	49.7587	43.3839	41.6222	35.9119	33.2776	38.1918	38.6532	45.0434	49.1625	53.3808 (65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	169.5524	169.5524	169.5524	169.5524	169.5524	169.5524	169.5524	169.5524	169.5524	169.5524	169.5524	169.5524 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	63.7726	56.6423	46.0646	34.8738	26.0686	22.0082	23.7807	30.9110	41.4887	52.6794	61.4846	65.5450 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	409.3823	413.6304	402.9253	380.1355	351.3673	324.3293	306.2663	302.0182	312.7233	335.5132	364.2813	391.3193 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.7811	54.7811	54.7811	54.7811	54.7811	54.7811	54.7811	54.7811	54.7811	54.7811	54.7811	54.7811 (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)	-113.0349	-113.0349	-113.0349	-113.0349	-113.0349	-113.0349	-113.0349	-113.0349	-113.0349	-113.0349	-113.0349	-113.0349 (71)
Water heating gains (Table 5)	74.0860	71.7472	66.8800	60.2554	55.9438	49.8776	44.7280	51.3331	53.6850	60.5422	68.2812	71.7483 (72)
Total internal gains	661.5395	656.3185	630.1685	589.5633	547.6783	510.5137	489.0735	498.5608	522.1956	563.0334	608.3457	642.9112 (73)

[Jan					Area	Solar flux		g	FF			Access			Gains
					m ²	Table 6a						factor			W
						W/m ²		Specific data	Specific data			Table 6d			
								or Table 6b	or Table 6c						
East					8.1710	19.6403		0.7300	0.7200			0.7700			58.4536 (76)
West					9.2460	19.6403		0.7300	0.7200			0.7700			66.1439 (80)
Solar gains	124.5975	243.7391	401.4036	585.4232	717.4581	734.4460	699.2226	600.6219	466.8490	289.2170	155.3584	102.4629	(83)		
Total gains	786.1370	900.0576	1031.5721	1174.9865	1265.1364	1244.9598	1188.2961	1099.1827	989.0445	852.2504	763.7041	745.3741	(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	13.5045	13.5480	13.5908	13.7958	13.8349	14.0196	14.0196	14.0543	13.9478	13.8349	13.7561	13.6747
alpha	1.9003	1.9032	1.9061	1.9197	1.9223	1.9346	1.9346	1.9370	1.9299	1.9223	1.9171	1.9116
util living area	0.9195	0.8955	0.8524	0.7774	0.6767	0.5528	0.4417	0.4817	0.6579	0.8197	0.8973	0.9262 (86)
MIT	17.7119	18.0446	18.6365	19.4040	20.0732	20.5716	20.8051	20.7620	20.3544	19.4686	18.4646	17.6566 (87)
Th 2	19.8255	19.8288	19.8320	19.8473	19.8501	19.8635	19.8635	19.8660	19.8583	19.8501	19.8443	19.8393 (88)
util rest of house	0.9100	0.8833	0.8347	0.7497	0.6332	0.4858	0.3495	0.3900	0.5970	0.7909	0.8833	0.9175 (89)
MIT 2	15.5421	16.0121	16.8454	17.9154	18.8192	19.4630	19.7271	19.6899	19.2124	18.0313	16.6207	15.4669 (90)
Living area fraction												0.1892 (91)
MIT	15.9526	16.3966	17.1842	18.1969	19.0564	19.6727	19.9310	19.8927	19.4284	18.3032	16.9695	15.8811 (92)
Temperature adjustment												-0.1500
adjusted MIT	15.8026	16.2466	17.0342	18.0469	18.9064	19.5227	19.7810	19.7427	19.2784	18.1532	16.8195	15.7311 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8609	0.8295	0.7774	0.6956	0.5915	0.4634	0.3421	0.3789	0.5605	0.7347	0.8300	0.8704 (94)
Useful gains	676.7756	746.6368	801.9732	817.2975	748.2991	576.8575	406.5699	416.5271	554.3134	626.1100	633.8739	648.7441 (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	1698.8915	1670.4782	1545.9838	1322.4481	1038.9453	700.3572	452.5673	474.3913	740.5269	1088.9434	1409.2844	1681.9068 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	760.4543	620.8214	553.5439	363.7084	216.2407	0.0000	0.0000	0.0000	0.0000	344.3480	558.2955	768.6730 (98)
Space heating												4186.0853 (98)
Space heating per m2												37.4025 (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													4640.8928 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	760.4543	620.8214	553.5439	363.7084	216.2407	0.0000	0.0000	0.0000	0.0000	344.3480	558.2955	768.6730	(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)	843.0757	688.2721	613.6850	403.2244	239.7347	0.0000	0.0000	0.0000	0.0000	381.7606	618.9529	852.1874	(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	110.8867	96.7145	100.3720	89.9523	87.5538	76.9694	73.8304	83.0735	83.5345	95.0078	100.9645	107.4907	(64)
Efficiency of water heater (217)m	88.1732	88.0562	87.7666	87.0812	85.7368	76.4000	76.4000	76.4000	76.4000	86.8093	87.7720	76.4000	(216)
Fuel for water heating, kWh/month	125.7601	109.8328	114.3624	103.2971	102.1193	100.7453	96.6366	108.7349	109.3383	109.4443	115.0304	121.8101	(219)
Water heating fuel used												1317.1116	(219)
Annual totals kWh/year													
Space heating fuel - main system												4640.8928	(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)												450.4976	(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												4756.2626	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	4640.8928	3.4800	161.5031 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1317.1116	3.4800	45.8355 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	450.4976	13.1900	59.4206 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-1727.2394	13.1900	-227.8229 (252)
Total energy cost			168.8288 (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] =	0.4519 (257)
SAP value	93.6964	
SAP rating (Section 12)	94	(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	4640.8928	0.2160	1002.4328 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1317.1116	0.2160	284.4961 (264)
Space and water heating			1286.9290 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	450.4976	0.5190	233.8082 (268)
Energy saving/generation technologies			
PV Unit	-1727.2394	0.5190	-896.4372 (269)
Total kg/year			663.2250 (272)
CO2 emissions per m2			5.9300 (273)
EI value			94.3365
EI rating			94 (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	55.9600 (1b)	x 2.3700 (2b)	= 132.6252 (1b) - (3b)
First floor	55.9600 (1c)	x 2.6200 (2c)	= 146.6152 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	111.9200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 279.2404 (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					5 * 10 = 50.0000 (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) =					50.0000 / (5) = 0.1791 (8)
Pressure test					Yes
Measured/design AP50					4.4900
Infiltration rate					0.4036 (18)
Number of sides sheltered					0 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.4036 (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	0.4944	0.4641	0.4540	0.4237	0.4237	0.4136	0.4136	0.4036	0.4036	0.4338	0.4338	0.4439 (22b)
Effective ac	0.6222	0.6077	0.6031	0.5898	0.5898	0.5856	0.5856	0.5814	0.5814	0.5941	0.5941	0.5985 (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			1.9000	1.2000	2.2800		(26)
Half Glazed Door			2.0900	1.4000	2.9260		(26a)
Windows (Uw = 1.40)			17.4200	1.3258	23.0947		(27)
Flr - Ground			55.9640	0.1800	10.0735	75.6000	4230.8784 (28a)
Wl - Brick (Timber Frame)	151.1190	21.4090	129.7100	0.2100	27.2391	7.4000	959.8540 (29a)
Rf - Ins Joist	55.9640		55.9640	0.0800	4.4771	7.4000	414.1336 (30)
Total net area of external elements Aum(A, m ²)			263.0480				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	70.0904		(33)
Stud			100.9904			7.4000	747.3293 (32c)
Internal Floor			55.9640			7.4000	414.1336 (32d)
Internal Ceiling			55.9640			7.4000	414.1336 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 7180.4625 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							64.1571 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							19.3336 (36)
Total fabric heat loss							(33) + (36) = 89.4240 (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	57.3348	55.9982	55.5715	54.3474	54.3474	53.9582	53.9582	53.5783	53.5783	54.7461	54.7461	55.1541 (38)
Heat transfer coeff	146.7589	145.4223	144.9955	143.7715	143.7715	143.3822	143.3822	143.0023	143.0023	144.1701	144.1701	144.5781 (39)
Average = Sum(39)m / 12 =												144.2006 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3113	1.2993	1.2955	1.2846	1.2846	1.2811	1.2811	1.2777	1.2777	1.2882	1.2882	1.2918 (40)
HLP (average)												1.2884 (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												2.8259 (42)
Average daily hot water use (litres/day)												101.3145 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	111.4459	107.3933	103.3408	99.2882	95.2356	91.1830	91.1830	95.2356	99.2882	103.3408	107.3933	111.4459 (44)
Energy conte	165.2711	144.5471	149.1597	130.0410	124.7775	107.6735	99.7753	114.4936	115.8610	135.0249	147.3902	160.0562 (45)
Energy content (annual)										Total = Sum(45)m =		1594.0712 (45)
Distribution loss (46)m = 0.15 x (45)m												

	24.7907	21.6821	22.3740	19.5062	18.7166	16.1510	14.9663	17.1740	17.3792	20.2537	22.1085	24.0084 (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	0.6694	0.6089	0.6525	0.5810	0.5347	0.4418	0.4094	0.4907	0.5177	0.5906	0.6208	0.6483 (61)
Total heat required for water heating calculated for each month	165.9405	145.1560	149.8122	130.6221	125.3122	108.1153	100.1847	114.9843	116.3787	135.6155	148.0111	160.7045 (62)
WWHRS	-55.0538	-48.4415	-49.4402	-40.6697	-37.7584	-31.1459	-26.3543	-31.9108	-32.8442	-40.6077	-47.0466	-53.2138 eq. (G10)
Total of WWHRS savings												-494.4869
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)
	110.8867	96.7145	100.3720	89.9523	87.5538	76.9694	73.8304	83.0735	83.5345	95.0078	100.9645	107.4907 (64)
								Total per year (kWh/year) =	Sum(64)m =			1106.3501 (64)
Heat gains from water heating, kWh/month	55.1200	48.2141	49.7587	43.3839	41.6222	35.9119	33.2776	38.1918	38.6532	45.0434	49.1625	53.3808 (65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	169.5524	169.5524	169.5524	169.5524	169.5524	169.5524	169.5524	169.5524	169.5524	169.5524	169.5524	169.5524 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	63.7726	56.6423	46.0646	34.8738	26.0686	22.0082	23.7807	30.9110	41.4887	52.6794	61.4846	65.5450 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	409.3823	413.6304	402.9253	380.1355	351.3673	324.3293	306.2663	302.0182	312.7233	335.5132	364.2813	391.3193 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.7811	54.7811	54.7811	54.7811	54.7811	54.7811	54.7811	54.7811	54.7811	54.7811	54.7811	54.7811 (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)	-113.0349	-113.0349	-113.0349	-113.0349	-113.0349	-113.0349	-113.0349	-113.0349	-113.0349	-113.0349	-113.0349	-113.0349 (71)
Water heating gains (Table 5)	74.0860	71.7472	66.8800	60.2554	55.9438	49.8776	44.7280	51.3331	53.6850	60.5422	68.2812	71.7483 (72)
Total internal gains	661.5395	656.3185	630.1685	589.5633	547.6783	510.5137	489.0735	498.5608	522.1956	563.0334	608.3457	642.9112 (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		
East					8.1710	25.1733	0.7300	0.7200	0.7700	74.9209 (76)		
West					9.2460	25.1733	0.7300	0.7200	0.7700	84.7777 (84)		
Solar gains	159.6987	265.7504	444.1435	650.7261	750.4148	847.5852	780.1350	699.0455	543.6524	344.2675	198.4736	129.0885 (83)
Total gains	821.2382	922.0689	1074.3119	1240.2894	1298.0931	1358.0990	1269.2085	1197.6063	1065.8480	907.3009	806.8193	771.9997 (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	13.5908	13.7157	13.7561	13.8732	13.8732	13.9109	13.9109	13.9478	13.9478	13.8349	13.8349	13.7958
alpha	1.9061	1.9144	1.9171	1.9249	1.9249	1.9274	1.9274	1.9299	1.9299	1.9223	1.9223	1.9197
util living area	0.9015	0.8780	0.8237	0.7317	0.6134	0.4484	0.3358	0.3429	0.5554	0.7574	0.8652	0.9086 (86)
MIT	18.1512	18.4174	19.0110	19.7365	20.3496	20.7653	20.9100	20.9098	20.6263	19.9155	18.9713	18.1435 (87)
Th 2	19.8320	19.8413	19.8443	19.8529	19.8529	19.8557	19.8557	19.8583	19.8583	19.8501	19.8501	19.8473 (88)
util rest of house	0.8892	0.8631	0.8019	0.6976	0.5596	0.3686	0.2312	0.2332	0.4759	0.7157	0.8454	0.8971 (89)
MIT 2	16.1686	16.5438	17.3734	18.3697	19.1776	19.6715	19.8125	19.8166	19.5369	18.6392	17.3379	16.1633 (90)
Living area fraction										fLA = Living area / (4) =		0.1892 (91)
MIT	16.5436	16.8982	17.6832	18.6282	19.3993	19.8784	20.0201	20.0234	19.7430	18.8806	17.6469	16.5379 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.3936	16.7482	17.5332	18.4782	19.2493	19.7284	19.8701	19.8734	19.5930	18.7306	17.4969	16.3879 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8364	0.8076	0.7451	0.6484	0.5274	0.3590	0.2326	0.2348	0.4550	0.6649	0.7891	0.8459 (94)
Useful gains	686.8449	744.6440	800.4412	804.2563	684.6098	487.5349	295.2557	281.1627	484.9824	603.2496	636.6411	653.0566 (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	1569.3818	1548.4888	1425.7642	1204.5494	884.0972	548.9276	311.1473	296.5007	585.3037	927.1033	1253.8271	1530.7745 (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	656.6075	540.1837	465.2403	288.2110	148.4186	0.0000	0.0000	0.0000	0.0000	240.9471	444.3739	653.0221 (98)
Space heating												3437.0042 (98)
Space heating per m2												30.7095 (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												3810.4260	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	656.6075	540.1837	465.2403	288.2110	148.4186	0.0000	0.0000	0.0000	0.0000	240.9471	444.3739	653.0221	(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)	727.9462	598.8733	515.7875	319.5244	164.5439	0.0000	0.0000	0.0000	0.0000	267.1254	492.6540	723.9713	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	110.8867	96.7145	100.3720	89.9523	87.5538	76.9694	73.8304	83.0735	83.5345	95.0078	100.9645	107.4907	(64)
Efficiency of water heater (217)m	87.9059	87.7920	87.3985	86.4842	84.5346	76.4000	76.4000	76.4000	76.4000	85.8164	87.2812	76.4000	(216)
Fuel for water heating, kWh/month	126.1424	110.1633	114.8441	104.0102	103.5716	100.7453	96.6366	108.7349	109.3383	110.7105	115.6772	122.2117	(219)
Water heating fuel used												1322.7862	(219)
Annual totals kWh/year													
Space heating fuel - main system												3810.4260	(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)												450.4976	(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												3712.2639	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3810.4260	7.6100	289.9734 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1322.7862	7.6100	100.6640 (247)
Pumps and fans for heating	75.0000	31.0800	23.3100 (249)
Energy for lighting	450.4976	31.0800	140.0146 (250)
Additional standing charges			105.0000 (251)
Energy saving/generation technologies			
PV Unit	-1946.4459	31.0800	-604.9554 (252)
Total energy cost			54.0067 (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	3810.4260	0.2160	823.0520 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1322.7862	0.2160	285.7218 (264)
Space and water heating			1108.7738 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	450.4976	0.5190	233.8082 (268)
Energy saving/generation technologies			
PV Unit	-1946.4459	0.5190	-1010.2054 (269)
Total kg/year			371.3016 (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	3810.4260	1.2200	4648.7197 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1322.7862	1.2200	1613.7992 (264)
Space and water heating			6262.5189 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	450.4976	3.0700	1383.0276 (268)
Energy saving/generation technologies			
PV Unit	-1946.4459	3.0700	-5975.5890 (269)
Primary energy kWh/year			1900.2074 (272)
Primary energy kWh/m2/year			16.9783 (273)

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Built)

Property Reference	028 - PRJ013014			Issued on Date	28/03/2024
Assessment Reference	028	Prop Type Ref	B		
Property	18 Deeble Way, Netley Way, Southampton, SO31 5JP				
SAP Rating	85 B	DER	14.82	TER	17.90
Environmental	87 B	% DER<TER	17.20		
CO ₂ Emissions (t/year)	1.38	DFEE	50.07	TFEE	58.19
General Requirements Compliance	Pass	% DFEE<TFEE	13.95		
Assessor Details	Mr. Christopher Nicholls, Briary Energy Limited, Tel: 0203 397 1373, chris@briaryenergy.co.uk			Assessor ID	4299-0004
Client					

SUMMARY FOR INPUT DATA FOR New Build (As Built)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	17.90	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.82	kgCO ₂ /m ²	Pass
	-3.08 (-17.2%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	58.19	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	50.07	kWh/m ² /yr	
	-8.1 (-13.9%)	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
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	1.38 (max. 2.00)	1.40 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.49 (measured in this dwelling)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

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
---------------------	--	------

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Built)

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

8.17 m², No overhang

Windows facing West

9.25 m², No overhang

Air change rate

4.70 ach

Blinds/curtains

Dark-coloured curtain or roller blind, closed 100% of daylight hours

Criterion 4 – Building performance consistent with DER and DFEE rate

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

4.49 (measured in this dwelling)

Maximum

10.0

Pass

10 Key features

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.