

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

Property Reference	036 - PRJ013014			Issued on Date	09/10/2024
Assessment Reference	036	Prop Type Ref	B		
Property	35 Deeble way, Netley Abbey, Southampton, SO31 5JP				
SAP Rating	85 B	DER	14.77	TER	17.77
Environmental	87 B	% DER<TER	16.88		
CO ₂ Emissions (t/year)	1.38	DFEE	49.61	TFEE	57.37
General Requirements Compliance	Pass	% DFEE<TFEE	13.52		
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	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									4.6700			
Infiltration rate									0.4126 (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) =	0.4126 (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	0.5054	0.4744	0.4641	0.4332	0.4332	0.4229	0.4229	0.4126	0.4126	0.4435	0.4435	0.4538 (22b)
Effective ac	0.6277	0.6125	0.6077	0.5938	0.5938	0.5894	0.5894	0.5851	0.5851	0.5983	0.5983	0.6030 (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)

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	57.8427	56.4458	55.9998	54.7205	54.7205	54.3137	54.3137	53.9167	53.9167	55.1372	55.1372	55.5636	(38)
Heat transfer coeff	147.2667	145.8698	145.4238	144.1446	144.1446	143.7378	143.7378	143.3408	143.3408	144.5612	144.5612	144.9876	(39)
Average = Sum(39)m / 12 =												144.5930	(39)
HLP	1.3158	1.3033	1.2994	1.2879	1.2879	1.2843	1.2843	1.2807	1.2807	1.2916	1.2916	1.2955	(40)
HLP (average)												1.2919	(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)	
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)	
	Total per year (kWh/year) = Sum(64)m =											1600.8370	(64)	
RHI water heating demand	1601												(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	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)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d	Gains W	
Southeast				9.2460	45.0642	0.7300		0.7200		0.7700	151.7658 (77)	
Northwest				8.1710	14.6130	0.7300		0.7200		0.7700	43.4915 (81)	
Solar gains	195.2573	295.8407	446.6772	617.1863	702.6665	794.6203	730.6636	657.3550	530.5891	367.2882	235.8251	162.5382 (83)
Total gains	856.7968	952.1592	1076.8456	1206.7496	1250.3448	1305.1340	1219.7372	1155.9158	1052.7846	930.3216	844.1708	805.4494 (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	13.5440	13.6736	13.7156	13.8373	13.8373	13.8765	13.8765	13.9149	13.9149	13.7974	13.7974	13.7569		
alpha	1.9029	1.9116	1.9144	1.9225	1.9225	1.9251	1.9251	1.9277	1.9277	1.9198	1.9198	1.9171		
util living area	0.8952	0.8725	0.8235	0.7402	0.6267	0.4622	0.3477	0.3536	0.5603	0.7507	0.8566	0.9027	(86)	
MIT	18.1927	18.4495	19.0071	19.7034	20.3207	20.7512	20.9038	20.9042	20.6191	19.9322	19.0132	18.1852	(87)	
Th 2	19.8285	19.8382	19.8413	19.8503	19.8503	19.8532	19.8532	19.8559	19.8559	19.8474	19.8474	19.8444	(88)	
util rest of house	0.8823	0.8571	0.8017	0.7066	0.5730	0.3810	0.2400	0.2411	0.4805	0.7084	0.8359	0.8906	(89)	
MIT 2	16.2252	16.5870	17.3668	18.3259	19.1428	19.6571	19.8068	19.8115	19.5280	18.6582	17.3935	16.2204	(90)	
Living area fraction									fLA = Living area / (4) =			0.1892	(91)	

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MIT	16.5973	16.9393	17.6771	18.5865	19.3656	19.8641	20.0143	20.0182	19.7344	18.8992	17.6999	16.5921 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.4473	16.7893	17.5271	18.4365	19.2156	19.7141	19.8643	19.8682	19.5844	18.7492	17.5499	16.4421 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8285	0.8010	0.7447	0.6564	0.5391	0.3702	0.2411	0.2424	0.4590	0.6582	0.7792	0.8383	(94)
Useful gains	709.8172	762.6882	801.9474	792.1506	674.0101	483.2204	294.0787	280.1576	483.2711	612.3492	657.7469	675.1753	(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													
	1582.7264	1559.2462	1429.0907	1201.6550	881.5342	548.2270	311.0909	296.4601	585.4642	932.3002	1264.8973	1542.9664	(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													
	649.4444	535.2870	466.5946	294.8432	154.3980	0.0000	0.0000	0.0000	0.0000	238.0435	437.1482	645.6366	(98)
Space heating													
RHI space heating demand												3421.3955	(98)
												3421	(98)

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CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	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					4.6700
Infiltration rate					0.4126 (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) =	0.4126 (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	0.5260	0.5157	0.5054	0.4538	0.4435	0.3919	0.3919	0.3816	0.4126	0.4435	0.4641	0.4848 (22b)
	0.6383	0.6330	0.6277	0.6030	0.5983	0.5768	0.5768	0.5728	0.5851	0.5983	0.6077	0.6175 (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	58.8229	58.3279	57.8427	55.5636	55.1372	53.1521	53.1521	52.7845	53.9167	55.1372	55.9998	56.9016 (38)
Heat transfer coeff	148.2470	147.7519	147.2667	144.9876	144.5612	142.5762	142.5762	142.2086	143.3408	144.5612	145.4238	146.3257 (39)
Average = Sum(39)m / 12 =												144.9856 (39)
HLP	1.3246	1.3202	1.3158	1.2955	1.2916	1.2739	1.2739	1.2706	1.2807	1.2916	1.2994	1.3074 (40)
HLP (average)												1.2954 (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	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)

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CALCULATION OF ENERGY RATINGS 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												90.2000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												4621.2647 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	753.8773	614.7327	553.5425	369.9496	223.5073	0.0000	0.0000	0.0000	0.0000	339.8837	550.9647	761.9230 (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)	835.7842	681.5219	613.6835	410.1436	247.7907	0.0000	0.0000	0.0000	0.0000	376.8112	610.8256	844.7040 (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	88.1581	88.0382	87.7666	87.1221	85.8360	76.4000	76.4000	76.4000	76.4000	86.7758	87.7454	76.4000 (216)
Fuel for water heating, kWh/month	125.7816	109.8551	114.3624	103.2487	102.0013	100.7453	96.6366	108.7349	109.3383	109.4865	115.0652	121.8306 (219)
Water heating fuel used												1317.0865 (219)
Annual totals kWh/year												
Space heating fuel - main system												4621.2647 (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												6463.8488 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	4621.2647	3.4800	160.8200 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1317.0865	3.4800	45.8346 (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			395.9678 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.0598 (257)
SAP value		85.2156
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	4621.2647	0.2160	998.1932 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1317.0865	0.2160	284.4907 (264)
Space and water heating			1282.6839 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	450.4976	0.5190	233.8082 (268)
Total kg/year			1555.4171 (272)
CO2 emissions per m2			13.9000 (273)
EI value			86.7177
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					4.6700
Infiltration rate					0.4126 (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) =	0.4126 (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	0.5054	0.4744	0.4641	0.4332	0.4332	0.4229	0.4229	0.4126	0.4126	0.4435	0.4435	0.4538 (22b)
Effective ac	0.6277	0.6125	0.6077	0.5938	0.5938	0.5894	0.5894	0.5851	0.5851	0.5983	0.5983	0.6030 (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	57.8427	56.4458	55.9998	54.7205	54.7205	54.3137	54.3137	53.9167	53.9167	55.1372	55.1372	55.5636 (38)
Heat transfer coeff	147.2667	145.8698	145.4238	144.1446	144.1446	143.7378	143.7378	143.3408	143.3408	144.5612	144.5612	144.9876 (39)
Average = Sum(39)m / 12 =												144.5930 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3158	1.3033	1.2994	1.2879	1.2879	1.2843	1.2843	1.2807	1.2807	1.2916	1.2916	1.2955 (40)
HLP (average)												1.2919 (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) -494.4869
Total of WWHRS savings	Solar input	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 (64)
Output from w/h	110.8867	96.7145	100.3720	89.9523	87.5538	76.9694	73.8304	83.0735	83.5345	95.0078	100.9645	107.4907 (63)
								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	
				m2	Table 6a	Specific data		Specific data	factor		W	
					W/m2	or Table 6b		or Table 6c	Table 6d			
Southeast				9.2460	45.0642	0.7300		0.7200	0.7700		151.7658	
Northwest				8.1710	14.6130	0.7300		0.7200	0.7700		43.4915 (77)	
Solar gains	195.2573	295.8407	446.6772	617.1863	702.6665	794.6203	730.6636	657.3550	530.5891	367.2882	235.8251	162.5382 (83)
Total gains	856.7968	952.1592	1076.8456	1206.7496	1250.3448	1305.1340	1219.7372	1155.9158	1052.7846	930.3216	844.1708	805.4494 (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	13.5440	13.6736	13.7156	13.8373	13.8373	13.8765	13.8765	13.9149	13.9149	13.7974	13.7974	13.7569
alpha	1.9029	1.9116	1.9144	1.9225	1.9225	1.9251	1.9251	1.9277	1.9277	1.9198	1.9198	1.9171
util living area	0.8952	0.8725	0.8235	0.7402	0.6267	0.4622	0.3477	0.3536	0.5603	0.7507	0.8566	0.9027 (86)
MIT	18.1927	18.4495	19.0071	19.7034	20.3207	20.7512	20.9038	20.9042	20.6191	19.9322	19.0132	18.1852 (87)
Th 2	19.8285	19.8382	19.8413	19.8503	19.8503	19.8532	19.8532	19.8559	19.8559	19.8474	19.8474	19.8444 (88)
util rest of house	0.8823	0.8571	0.8017	0.7066	0.5730	0.3810	0.2400	0.2411	0.4805	0.7084	0.8359	0.8906 (89)
MIT 2	16.2252	16.5870	17.3668	18.3259	19.1428	19.6571	19.8068	19.8115	19.5280	18.6582	17.3935	16.2204 (90)
Living area fraction									fLA = Living area / (4) =			0.1892 (91)
MIT	16.5973	16.9393	17.6771	18.5865	19.3656	19.8641	20.0143	20.0182	19.7344	18.8992	17.6999	16.5921 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.4473	16.7893	17.5271	18.4365	19.2156	19.7141	19.8643	19.8682	19.5844	18.7492	17.5499	16.4421 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8285	0.8010	0.7447	0.6564	0.5391	0.3702	0.2411	0.2424	0.4590	0.6582	0.7792	0.8383 (94)
Useful gains	709.8172	762.6882	801.9474	792.1506	674.0101	483.2204	294.0787	280.1576	483.2711	612.3492	657.7469	675.1753 (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	1582.7264	1559.2462	1429.0907	1201.6550	881.5342	548.2270	311.0909	296.4601	585.4642	932.3002	1264.8973	1542.9664 (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	649.4444	535.2870	466.5946	294.8432	154.3980	0.0000	0.0000	0.0000	0.0000	238.0435	437.1482	645.6366 (98)
Space heating												3421.3955 (98)
Space heating per m2										(98) / (4) =		30.5700 (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												3793.1214 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	649.4444	535.2870	466.5946	294.8432	154.3980	0.0000	0.0000	0.0000	0.0000	238.0435	437.1482	645.6366 (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)	720.0049	593.4446	517.2889	326.8771	171.1729	0.0000	0.0000	0.0000	0.0000	263.9064	484.6433	715.7833 (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	87.8849	87.7738	87.4050	86.5456	84.6660	76.4000	76.4000	76.4000	76.4000	85.7800	87.2433	76.4000 (216)
Fuel for water heating, kWh/month	126.1727	110.1861	114.8355	103.9363	103.4108	100.7453	96.6366	108.7349	109.3383	110.7575	115.7275	122.2415 (219)
Water heating fuel used												1322.7231 (219)
Annual totals kWh/year												
Space heating fuel - main system												3793.1214 (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												5641.3421 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3793.1214	7.6100	288.6565 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1322.7231	7.6100	100.6592 (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			657.6404 (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	3793.1214	0.2160	819.3142 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1322.7231	0.2160	285.7082 (264)
Space and water heating			1105.0224 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	450.4976	0.5190	233.8082 (268)
Total kg/year			1377.7557 (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	3793.1214	1.2200	4627.6081 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1322.7231	1.2200	1613.7222 (264)
Space and water heating			6241.3303 (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			7854.6079 (272)
Primary energy kWh/m2/year			70.1806 (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	Already installed
F		Not considered
G		Not considered
H		Not considered
I		Not considered
J		Not considered
K		Not considered
M		Not considered
N	Solar water heating	SAP increase too small
O		Not considered
P		Not considered
R		Not considered
S		Not considered
T		Not considered
U	Solar photovoltaic panels	Recommended
A2		Not considered
A3		Not considered
T2		Not considered
W		Not considered
X		Not considered
Y		Not considered
J2		Not considered
Q2		Not considered
Z1		Not considered
Z2		Not considered
Z3		Not considered
Z4		Not considered
Z5		Not considered
V2	Wind turbine	Not applicable
L2		Not considered
Q3		Not considered
O3		Not considered

Recommended measures:	SAP change	Cost change	CO2 change
U Solar photovoltaic panels	+ 8.5	-£ 605	-1010 kg (73.3%)

Measures omitted - SAP change or cost saving too small:

N Solar water heating	+ 0.8	-£ 47	-151 kg (10.9%)
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Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar photovoltaic panels	£605 9.03 kg/m²	A 94	A 94
Total Savings	£605 9.03 kg/m²		
Potential energy efficiency rating:		A 94	
Potential environmental impact rating:			A 94

Fuel prices for cost data on this page from database revision number 542 TEST (30 Apr 2024)
Recommendation texts revision number 4.9c (22 Feb 2014)

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

	Current	Potential	Saving
Electricity	£163	£163	£0
Mains gas	£494	£494	£0
Space heating	£417	£417	£0
Water heating	£101	£101	£0
Lighting	£140	£140	£0
Generated (PV)	-£0	-£605	£605
Total cost of fuels	£657	£52	£605
Total cost of uses	£658	£53	£605
Delivered energy	50 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	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					4.6700
Infiltration rate					0.4126 (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) =	0.4126 (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	0.5260	0.5157	0.5054	0.4538	0.4435	0.3919	0.3919	0.3816	0.4126	0.4435	0.4641	0.4848 (22b)
	0.6383	0.6330	0.6277	0.6030	0.5983	0.5768	0.5768	0.5728	0.5851	0.5983	0.6077	0.6175 (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	58.8229	58.3279	57.8427	55.5636	55.1372	53.1521	53.1521	52.7845	53.9167	55.1372	55.9998	56.9016 (38)
Heat transfer coeff	148.2470	147.7519	147.2667	144.9876	144.5612	142.5762	142.5762	142.2086	143.3408	144.5612	145.4238	146.3257 (39)
Average = Sum(39)m / 12 =												144.9856 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3246	1.3202	1.3158	1.2955	1.2916	1.2739	1.2739	1.2706	1.2807	1.2916	1.2994	1.3074 (40)
HLP (average)												1.2954 (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)
								Solar input (sum of months) = Sum(63)m =				0.0000 (63)
Output from w/h	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			
Southeast				9.2460	36.7938	0.7300	0.7200	0.7700	123.9132 (77)			
Northwest				8.1710	11.2829	0.7300	0.7200	0.7700	33.5804 (81)			
Solar gains	157.4936	279.4239	411.9472	560.0822	672.6658	687.7393	654.7568	567.7163	462.7668	316.8112	190.6723	133.4673 (83)
Total gains	819.0331	935.7424	1042.1157	1149.6455	1220.3441	1198.2530	1143.8304	1066.2771	984.9623	879.8446	799.0180	776.3785 (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	13.4544	13.4995	13.5440	13.7569	13.7974	13.9895	13.9895	14.0257	13.9149	13.7974	13.7156	13.6311
alpha	1.8970	1.9000	1.9029	1.9171	1.9198	1.9326	1.9326	1.9350	1.9277	1.9198	1.9144	1.9087
util living area	0.9144	0.8896	0.8507	0.7836	0.6888	0.5666	0.4548	0.4925	0.6598	0.8125	0.8904	0.9214 (86)
MIT	17.7508	18.0845	18.6409	19.3732	20.0380	20.5504	20.7938	20.7514	20.3492	19.4943	18.5073	17.6954 (87)
Th 2	19.8216	19.8251	19.8285	19.8444	19.8474	19.8613	19.8613	19.8639	19.8559	19.8474	19.8413	19.8350 (88)
util rest of house	0.9044	0.8768	0.8328	0.7563	0.6458	0.4992	0.3609	0.3998	0.5988	0.7829	0.8756	0.9122 (89)
MIT 2	15.5958	16.0664	16.8500	17.8734	18.7746	19.4394	19.7164	19.6794	19.2049	18.0635	16.6787	15.5206 (90)
Living area fraction										fLA = Living area / (4) =		0.1892 (91)
MIT	16.0034	16.4482	17.1887	18.1571	19.0136	19.6495	19.9202	19.8821	19.4213	18.3342	17.0246	15.9320 (92)
Temperature adjustment												-0.1500
adjusted MIT	15.8534	16.2982	17.0387	18.0071	18.8636	19.4995	19.7702	19.7321	19.2713	18.1842	16.8746	15.7820 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8540	0.8221	0.7753	0.7016	0.6024	0.4751	0.3526	0.3878	0.5620	0.7269	0.8213	0.8638 (94)
Useful gains	699.4806	769.3199	807.9963	806.6005	735.1618	569.3333	403.3568	413.4631	553.5593	639.5417	656.2353	670.6506 (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	1712.7565	1684.1008	1552.0050	1320.4194	1035.5747	698.5568	451.9969	473.8584	741.2607	1096.3746	1421.4641	1694.7406 (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	753.8773	614.7327	553.5425	369.9496	223.5073	0.0000	0.0000	0.0000	0.0000	339.8837	550.9647	761.9230 (98)
Space heating												4168.3807 (98)
Space heating per m2												37.2443 (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												4621.2647	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	753.8773	614.7327	553.5425	369.9496	223.5073	0.0000	0.0000	0.0000	0.0000	339.8837	550.9647	761.9230	(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)	835.7842	681.5219	613.6835	410.1436	247.7907	0.0000	0.0000	0.0000	0.0000	376.8112	610.8256	844.7040	(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	88.1581	88.0382	87.7666	87.1221	85.8360	76.4000	76.4000	76.4000	76.4000	86.7758	87.7454	76.4000	(216)
Fuel for water heating, kWh/month	125.7816	109.8551	114.3624	103.2487	102.0013	100.7453	96.6366	108.7349	109.3383	109.4865	115.0652	121.8306	(219)
Water heating fuel used												1317.0865	(219)
Annual totals kWh/year													
Space heating fuel - main system												4621.2647	(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												4736.6094	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	4621.2647	3.4800	160.8200 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1317.0865	3.4800	45.8346 (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			168.1449 (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] =	0.4500 (257)
SAP value	93.7219	
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	4621.2647	0.2160	998.1932 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1317.0865	0.2160	284.4907 (264)
Space and water heating			1282.6839 (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			658.9799 (272)
CO2 emissions per m2			5.8900 (273)
EI value			94.3727
EI rating			94
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					4.6700
Infiltration rate					0.4126 (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) =	0.4126 (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	0.5054	0.4744	0.4641	0.4332	0.4332	0.4229	0.4229	0.4126	0.4126	0.4435	0.4435	0.4538 (22b)
Effective ac	0.6277	0.6125	0.6077	0.5938	0.5938	0.5894	0.5894	0.5851	0.5851	0.5983	0.5983	0.6030 (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	57.8427	56.4458	55.9998	54.7205	54.7205	54.3137	54.3137	53.9167	53.9167	55.1372	55.1372	55.5636 (38)
Heat transfer coeff	147.2667	145.8698	145.4238	144.1446	144.1446	143.7378	143.7378	143.3408	143.3408	144.5612	144.5612	144.9876 (39)
Average = Sum(39)m / 12 =												144.5930 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3158	1.3033	1.2994	1.2879	1.2879	1.2843	1.2843	1.2807	1.2807	1.2916	1.2916	1.2955 (40)
HLP (average)												1.2919 (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)
								Solar input	(sum of months) = Sum(63)m =			0.0000 (63)
Output from w/h	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	
				m2	Table 6a	Specific data		Specific data	factor		W	
					W/m2	or Table 6b		or Table 6c	Table 6d			
Southeast				9.2460	45.0642	0.7300		0.7200	0.7700		151.7658	
Northwest				8.1710	14.6130	0.7300		0.7200	0.7700		43.4915 (77)	
Solar gains	195.2573	295.8407	446.6772	617.1863	702.6665	794.6203	730.6636	657.3550	530.5891	367.2882	235.8251	162.5382 (83)
Total gains	856.7968	952.1592	1076.8456	1206.7496	1250.3448	1305.1340	1219.7372	1155.9158	1052.7846	930.3216	844.1708	805.4494 (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	13.5440	13.6736	13.7156	13.8373	13.8373	13.8765	13.8765	13.9149	13.9149	13.7974	13.7974	13.7569
alpha	1.9029	1.9116	1.9144	1.9225	1.9225	1.9251	1.9251	1.9277	1.9277	1.9198	1.9198	1.9171
util living area	0.8952	0.8725	0.8235	0.7402	0.6267	0.4622	0.3477	0.3536	0.5603	0.7507	0.8566	0.9027 (86)
MIT	18.1927	18.4495	19.0071	19.7034	20.3207	20.7512	20.9038	20.9042	20.6191	19.9322	19.0132	18.1852 (87)
Th 2	19.8285	19.8382	19.8413	19.8503	19.8503	19.8532	19.8532	19.8559	19.8559	19.8474	19.8474	19.8444 (88)
util rest of house	0.8823	0.8571	0.8017	0.7066	0.5730	0.3810	0.2400	0.2411	0.4805	0.7084	0.8359	0.8906 (89)
MIT 2	16.2252	16.5870	17.3668	18.3259	19.1428	19.6571	19.8068	19.8115	19.5280	18.6582	17.3935	16.2204 (90)
Living area fraction									fLA = Living area / (4) =			0.1892 (91)
MIT	16.5973	16.9393	17.6771	18.5865	19.3656	19.8641	20.0143	20.0182	19.7344	18.8992	17.6999	16.5921 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.4473	16.7893	17.5271	18.4365	19.2156	19.7141	19.8643	19.8682	19.5844	18.7492	17.5499	16.4421 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8285	0.8010	0.7447	0.6564	0.5391	0.3702	0.2411	0.2424	0.4590	0.6582	0.7792	0.8383 (94)
Useful gains	709.8172	762.6882	801.9474	792.1506	674.0101	483.2204	294.0787	280.1576	483.2711	612.3492	657.7469	675.1753 (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	1582.7264	1559.2462	1429.0907	1201.6550	881.5342	548.2270	311.0909	296.4601	585.4642	932.3002	1264.8973	1542.9664 (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	649.4444	535.2870	466.5946	294.8432	154.3980	0.0000	0.0000	0.0000	0.0000	238.0435	437.1482	645.6366 (98)
Space heating												3421.3955 (98)
Space heating per m2												30.5700 (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												3793.1214 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	649.4444	535.2870	466.5946	294.8432	154.3980	0.0000	0.0000	0.0000	0.0000	238.0435	437.1482	645.6366 (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)	720.0049	593.4446	517.2889	326.8771	171.1729	0.0000	0.0000	0.0000	0.0000	263.9064	484.6433	715.7833 (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	87.8849	87.7738	87.4050	86.5456	84.6660	76.4000	76.4000	76.4000	76.4000	85.7800	87.2433	76.4000 (216)
Fuel for water heating, kWh/month	126.1727	110.1861	114.8355	103.9363	103.4108	100.7453	96.6366	108.7349	109.3383	110.7575	115.7275	122.2415 (219)
Water heating fuel used												1322.7231 (219)
Annual totals kWh/year												
Space heating fuel - main system												3793.1214 (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												3694.8961 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3793.1214	7.6100	288.6565 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1322.7231	7.6100	100.6592 (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			52.6850 (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	3793.1214	0.2160	819.3142 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1322.7231	0.2160	285.7082 (264)
Space and water heating			1105.0224 (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			367.5502 (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	3793.1214	1.2200	4627.6081 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1322.7231	1.2200	1613.7222 (264)
Space and water heating			6241.3303 (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			1879.0188 (272)
Primary energy kWh/m2/year			16.7889 (273)

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Built)

Property Reference	036 - PRJ013014	Issued on Date	09/10/2024
Assessment Reference	036	Prop Type Ref	B
Property	35 Deeble way, Netley Abbey, Southampton, SO31 5JP		
SAP Rating	85 B	DER	14.77
Environmental	87 B	% DER<TER	16.88
CO ₂ Emissions (t/year)	1.38	DFEE	49.61
General Requirements Compliance	Pass	% DFEE<TFEE	13.52
Assessor Details	Mr. Christopher Nicholls, Briary Energy Limited, Tel: 0203 397 1373, chris@briaryenergy.co.uk		Assessor ID
Client	U903-0001		

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)	17.77	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.77	kgCO ₂ /m ²	Pass
	-3.00 (-16.9%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	57.37	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	49.61	kWh/m ² /yr	
	-7.8 (-13.6%)	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	4.67 (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
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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 South East

9.25 m², No overhang

Windows facing North West

8.17 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

4.67 (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.