

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

Property Reference	055 - PRJ013014	Issued on Date	21/10/2024
Assessment Reference	055	Prop Type Ref	2B
Property	18 Erwood Close, Netley Abbey, Southampton, SO31 5TJ		

SAP Rating	85 B	DER	15.12	TER	18.35
Environmental	88 B	% DER<TER	17.59		
CO ₂ Emissions (t/year)	1.04	DFEE	45.71	TTEE	50.80
General Requirements Compliance	Pass	% DFEE<TFEE	10.02		

Assessor Details	Mr. Christopher Nicholls, Briary Energy Limited, Tel: 0203 397 1373, chris@briaryenergy.co.uk	Assessor ID	U903-0001
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Client	
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CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	40.9100 (1b)	x 2.3700 (2b)	= 96.9567 (1b) - (3b)
First floor	40.9100 (1c)	x 2.6200 (2c)	= 107.1842 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.8200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 204.1409 (5)

2. Ventilation rate

	main heating		secondary heating	other		total	m3 per hour					
Number of chimneys	0	+	0	+	0	=	0 * 40 = 0.0000 (6a)					
Number of open flues	0	+	0	+	0	=	0 * 20 = 0.0000 (6b)					
Number of intermittent fans							3 * 10 = 30.0000 (7a)					
Number of passive vents							0 * 10 = 0.0000 (7b)					
Number of flueless gas fires							0 * 40 = 0.0000 (7c)					
							Air changes per hour					
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) =	0.1470 (8)					
Pressure test						Yes	4.9700					
Measured/design AP50							0.3955 (18)					
Infiltration rate							1 (19)					
Number of sides sheltered												
Shelter factor						(20) = 1 - [0.075 x (19)] =	0.9250 (20)					
Infiltration rate adjusted to include shelter factor						(21) = (18) x (20) =	0.3658 (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	0.4481	0.4207	0.4115	0.3841	0.3841	0.3749	0.3749	0.3658	0.3658	0.3932	0.3932	0.4024 (22b)
Effective ac	0.6004	0.5885	0.5847	0.5738	0.5738	0.5703	0.5703	0.5669	0.5669	0.5773	0.5773	0.5810 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Solid Door			2.0900	1.2000	2.5080		(26)
Windows (Uw = 1.40)			9.0800	1.3258	12.0379		(27)
Flr - Ground			40.9120	0.1800	7.3642	75.6000	3092.9472 (28a)
Wl - Brick (Timber Frame)	90.3710	11.1690	79.2020	0.2100	16.6324	7.4000	586.0948 (29a)
Rf - Ins Joist	40.9120		40.9120	0.0800	3.2730	7.4000	302.7488 (30)
Total net area of external elements Aum(A, m ²)			172.1960				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.8154		(33)
Party Wall			46.2040	0.0000	0.0000	7.4000	341.9096 (32)
Stud			70.7018			7.4000	523.1936 (32c)
Internal Floor			40.9120			7.4000	302.7488 (32d)
Internal Ceiling			40.9120			7.4000	302.7488 (32e)
Heat capacity Cm = Sum (A x k)							(28)...(30) + (32) + (32a)...(32e) = 5452.3916 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							66.6389 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.3835 (36)
Total fabric heat loss							(33) + (36) = 57.1989 (37)

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

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(38)m	Jan 40.4467	Feb 39.6439	Mar 39.3875	Apr 38.6523	May 38.6523	Jun 38.4185	Jul 38.4185	Aug 38.1903	Sep 38.1903	Oct 38.8918	Nov 38.8918	Dec 39.1368 (38)
Heat transfer coeff	97.6456	96.8428	96.5865	95.8512	95.8512	95.6174	95.6174	95.3893	95.3893	96.0907	96.0907	96.3358 (39)
Average = Sum(39)m / 12 =												96.1090 (39)
HLP	Jan 1.1934	Feb 1.1836	Mar 1.1805	Apr 1.1715	May 1.1715	Jun 1.1686	Jul 1.1686	Aug 1.1658	Sep 1.1658	Oct 1.1744	Nov 1.1744	Dec 1.1774 (40)
HLP (average)												1.1746 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4965 (42)
Average daily hot water use (litres/day)												93.4916 (43)
Daily hot water use	Jan 102.8407	Feb 99.1011	Mar 95.3614	Apr 91.6217	May 87.8821	Jun 84.1424	Jul 84.1424	Aug 87.8821	Sep 91.6217	Oct 95.3614	Nov 99.1011	Dec 102.8407 (44)
Energy conte	152.5098	133.3861	137.6425	120.0000	115.1429	99.3596	92.0712	105.6531	106.9149	124.5990	136.0096	147.6976 (45)
Energy content (annual)										Total = Sum(45)m =		1470.9864 (45)
Distribution loss (46)m = 0.15 x (45)m	22.8765	20.0079	20.6464	18.0000	17.2714	14.9039	13.8107	15.8480	16.0372	18.6899	20.4014	22.1546 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	0.6702	0.5948	0.5907	0.4948	0.4554	0.3762	0.3486	0.4178	0.4408	0.5347	0.6065	0.6490 (61)
Total heat required for water heating calculated for each month	153.1800	133.9809	138.2331	120.4948	115.5983	99.7358	92.4199	106.0709	107.3557	125.1337	136.6161	148.3467 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	153.1800	133.9809	138.2331	120.4948	115.5983	99.7358	92.4199	106.0709	107.3557	125.1337	136.6161	148.3467 (64)
RHI water heating demand												
Heat gains from water heating, kWh/month	50.8771	44.4996	45.9138	40.0237	38.3989	33.1311	30.7008	35.2341	35.6594	41.5629	45.3748	49.2717 (65)

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

Metabolic gains (Table 5), Watts	Jan 149.7892	Feb 149.7892	Mar 149.7892	Apr 149.7892	May 149.7892	Jun 149.7892	Jul 149.7892	Aug 149.7892	Sep 149.7892	Oct 149.7892	Nov 149.7892	Dec 149.7892 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.8308	49.5885	40.3280	30.5309	22.8222	19.2675	20.8192	27.0616	36.3220	46.1191	53.8278	57.3825 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	333.1376	336.5945	327.8832	309.3378	285.9275	263.9252	249.2263	245.7693	254.4807	273.0261	296.4364	318.4387 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595 (71)
Water heating gains (Table 5)	68.3832	66.2196	61.7121	55.5885	51.6114	46.0154	41.2646	47.3577	49.5270	55.8641	63.0206	66.2254 (72)
Total internal gains	562.7568	557.8078	535.3285	500.8623	465.7663	434.6133	416.7152	425.5938	445.7348	480.4144	518.6899	547.4518 (73)

6. Solar gains

[Jan]												Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
East												2.7240	25.1733	0.7300	0.7200	0.7700	24.9767 (76)
West												6.3550	25.1733	0.7300	0.7200	0.7700	58.2698 (80)

Solar gains	83.2465	138.5284	231.5197	339.2055	391.1705	441.8227	406.6628	364.3931	283.3910	179.4571	103.4588			67.2903 (83)			
Total gains	646.0033	696.3361	766.8482	840.0678	856.9367	876.4360	823.3780	789.9868	729.1258	659.8715	622.1487			614.7421 (84)			

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	Jan 15.5107	Feb 15.6393	Mar 15.6808	Apr 15.8011	May 15.8011	Jun 15.8397	Jul 15.8397	Aug 15.8776	Sep 15.8776	Oct 15.7617	Nov 15.7617	Dec 15.7216
alpha	2.0340	2.0426	2.0454	2.0534	2.0534	2.0560	2.0560	2.0585	2.0585	2.0508	2.0508	2.0481
util living area	0.8881	0.8689	0.8229	0.7425	0.6301	0.4677	0.3485	0.3510	0.5580	0.7477	0.8503	0.8944 (86)
MIT	18.5328	18.7441	19.2380	19.8604	20.4120	20.7893	20.9225	20.9241	20.6805	20.0740	19.2612	18.5314 (87)
Th 2	19.9253	19.9331	19.9357	19.9429	19.9429	19.9452	19.9452	19.9474	19.9474	19.9405	19.9405	19.9381 (88)
util rest of house	0.8750	0.8539	0.8020	0.7106	0.5795	0.3913	0.2484	0.2472	0.4832	0.7073	0.8299	0.8820 (89)
MIT 2	16.7187	17.0192	17.7155	18.5799	19.3163	19.7726	19.9051	19.9096	19.6638	18.8900	17.7635	16.7222 (90)
Living area fraction									fLA = Living area / (4) =			0.1678 (91)

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MIT	17.0231	17.3086	17.9710	18.7948	19.5002	19.9432	20.0758	20.0799	19.8344	19.0887	18.0148	17.0258 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.8731	17.1586	17.8210	18.6448	19.3502	19.7932	19.9258	19.9299	19.6844	18.9387	17.8648	16.8758 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8235	0.8011	0.7490	0.6639	0.5474	0.3794	0.2464	0.2453	0.4623	0.6608	0.7767	0.8316	(94)
Useful gains	532.0087	557.8595	574.3339	557.7471	469.0685	332.5341	202.8932	193.7998	337.0529	436.0264	483.2282	511.2383	(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													
Month fracti	1091.0044	1070.9471	977.5539	819.0281	599.0871	372.2610	212.8272	203.1662	399.1465	637.9125	871.0442	1066.9950	(97)
Space heating kWh	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	415.8928	344.7949	299.9957	188.1223	96.7338	0.0000	0.0000	0.0000	0.0000	150.2033	279.2275	413.4830	(98)
RHI space heating demand												2188.4532	(98)
												2188	(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	40.9100 (1b)	x 2.3700 (2b)	= 96.9567 (1b) - (3b)
First floor	40.9100 (1c)	x 2.6200 (2c)	= 107.1842 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.8200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 204.1409 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1470 (8)
Pressure test					Yes
Measured/design AP50					4.9700
Infiltration rate					0.3955 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3658 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4664	0.4572	0.4481	0.4024	0.3932	0.3475	0.3475	0.3384	0.3658	0.3932	0.4115	0.4298 (22b)
Effective ac	0.6088	0.6045	0.6004	0.5810	0.5773	0.5604	0.5604	0.5572	0.5669	0.5773	0.5847	0.5924 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Solid Door			2.0900	1.2000	2.5080		(26)
Windows (Uw = 1.40)			9.0800	1.3258	12.0379		(27)
Flr - Ground			40.9120	0.1800	7.3642	75.6000	3092.9472 (28a)
Wl - Brick (Timber Frame)	90.3710	11.1690	79.2020	0.2100	16.6324	7.4000	586.0948 (29a)
Rf - Ins Joist	40.9120		40.9120	0.0800	3.2730	7.4000	302.7488 (30)
Total net area of external elements Aum(A, m ²)			172.1960				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.8154		(33)
Party Wall			46.2040	0.0000	0.0000	7.4000	341.9096 (32)
Stud			70.7018			7.4000	523.1936 (32c)
Internal Floor			40.9120			7.4000	302.7488 (32d)
Internal Ceiling			40.9120			7.4000	302.7488 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 5452.3916 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							66.6389 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.3835 (36)
Total fabric heat loss							(33) + (36) = 57.1989 (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	41.0101	40.7256	40.4467	39.1368	38.8918	37.7509	37.7509	37.5396	38.1903	38.8918	39.3875	39.9059 (38)
Heat transfer coeff	98.2090	97.9245	97.6456	96.3358	96.0907	94.9498	94.9498	94.7386	95.3893	96.0907	96.5865	97.1048 (39)
Average = Sum(39)m / 12 =												96.3346 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2003	1.1968	1.1934	1.1774	1.1744	1.1605	1.1605	1.1579	1.1658	1.1744	1.1805	1.1868 (40)
HLP (average)												1.1774 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4965 (42)
Average daily hot water use (litres/day)												93.4916 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	102.8407	99.1011	95.3614	91.6217	87.8821	84.1424	84.1424	87.8821	91.6217	95.3614	99.1011	102.8407 (44)
Energy conte	152.5098	133.3861	137.6425	120.0000	115.1429	99.3596	92.0712	105.6531	106.9149	124.5990	136.0096	147.6976 (45)
Energy content (annual)												Total = Sum(45)m = 1470.9864 (45)
Distribution loss (46)m = 0.15 x (45)m												

	22.8765	20.0079	20.6464	18.0000	17.2714	14.9039	13.8107	15.8480	16.0372	18.6899	20.4014	22.1546 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	0.6702	0.5948	0.5907	0.4948	0.4554	0.3762	0.3486	0.4178	0.4408	0.5347	0.6065	0.6490 (61)
Total heat required for water heating calculated for each month	153.1800	133.9809	138.2331	120.4948	115.5983	99.7358	92.4199	106.0709	107.3557	125.1337	136.6161	148.3467 (62)
WWHRS	-49.4854	-43.5394	-44.4384	-36.5722	-33.9630	-28.0213	-23.7216	-28.7193	-29.5543	-36.5280	-42.3034	-47.8278 eq. (G10)
Total of WWHRS savings												-444.6741
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	103.6946	90.4415	93.7947	83.9226	81.6353	71.7145	68.6982	77.3516	77.8015	88.6057	94.3127	100.5189 (64)
Heat gains from water heating, kWh/month	50.8771	44.4996	45.9138	40.0237	38.3989	33.1311	30.7008	35.2341	35.6594	41.5629	45.3748	49.2717 (65)

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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												2968.6591 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	483.5052	397.6054	357.5544	237.4815	141.8623	0.0000	0.0000	0.0000	0.0000	217.0675	353.3397	489.3145 (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)	536.0368	440.8042	396.4017	263.2833	157.2753	0.0000	0.0000	0.0000	0.0000	240.6513	391.7292	542.4773 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating requirement	103.6946	90.4415	93.7947	83.9226	81.6353	71.7145	68.6982	77.3516	77.8015	88.6057	94.3127	100.5189 (64)
Efficiency of water heater (217)m	87.4118	87.2785	86.9367	86.1374	84.6172	76.4000	76.4000	76.4000	76.4000	85.7122	86.8933	76.4000 (216)
Fuel for water heating, kWh/month	118.6277	103.6239	107.8885	97.4288	96.4760	93.8672	89.9191	101.2456	101.8344	103.3758	108.5386	114.8704 (219)
Water heating fuel used												1237.6961 (219)
Annual totals kWh/year												
Space heating fuel - main system												2968.6591 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												75.0000 (231)
Electricity for lighting (calculated in Appendix L)												394.3960 (232)
Total delivered energy for all uses												4675.7512 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2968.6591	3.4800	103.3093 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1237.6961	3.4800	43.0718 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	394.3960	13.1900	52.0208 (250)
Additional standing charges			120.0000 (251)
Total energy cost			328.2945 (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] =	1.0872 (257)
SAP value		84.8330
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	2968.6591	0.2160	641.2304 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1237.6961	0.2160	267.3424 (264)
Space and water heating			908.5727 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	394.3960	0.5190	204.6915 (268)
Total kg/year			1152.1893 (272)
CO2 emissions per m2			14.0800 (273)
EI value			87.8258
EI rating			88 (274)
EI band			B

Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9020 = 3.858$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9020 = 0.2395$, stars = 4
Water heating energy efficiency	$3.48 / 0.8317 = 4.184$, stars = 5
Water heating environmental impact	$0.216 / 0.8317 = 0.2597$, stars = 5

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	40.9100 (1b)	x 2.3700 (2b)	= 96.9567 (1b) - (3b)
First floor	40.9100 (1c)	x 2.6200 (2c)	= 107.1842 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.8200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 204.1409 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1470 (8)
Pressure test					Yes
Measured/design AP50					4.9700
Infiltration rate					0.3955 (18)
Number of sides sheltered					1 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3658 (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												
Effective ac	0.4481	0.4207	0.4115	0.3841	0.3841	0.3749	0.3749	0.3658	0.3658	0.3932	0.3932	0.4024 (22b)
	0.6004	0.5885	0.5847	0.5738	0.5738	0.5703	0.5703	0.5669	0.5669	0.5773	0.5773	0.5810 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Solid Door			2.0900	1.2000	2.5080		(26)
Windows (Uw = 1.40)			9.0800	1.3258	12.0379		(27)
Flr - Ground			40.9120	0.1800	7.3642	75.6000	3092.9472 (28a)
Wl - Brick (Timber Frame)	90.3710	11.1690	79.2020	0.2100	16.6324	7.4000	586.0948 (29a)
Rf - Ins Joist	40.9120		40.9120	0.0800	3.2730	7.4000	302.7488 (30)
Total net area of external elements Aum(A, m ²)			172.1960				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.8154		(33)
Party Wall			46.2040	0.0000	0.0000	7.4000	341.9096 (32)
Stud			70.7018			7.4000	523.1936 (32c)
Internal Floor			40.9120			7.4000	302.7488 (32d)
Internal Ceiling			40.9120			7.4000	302.7488 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.4467	39.6439	39.3875	38.6523	38.6523	38.4185	38.4185	38.1903	38.1903	38.8918	38.8918	39.1368 (38)
Heat transfer coeff	97.6456	96.8428	96.5865	95.8512	95.8512	95.6174	95.6174	95.3893	95.3893	96.0907	96.0907	96.3358 (39)
Average = Sum(39)m / 12 =												96.1090 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1934	1.1836	1.1805	1.1715	1.1715	1.1686	1.1686	1.1658	1.1658	1.1744	1.1744	1.1774 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4965 (42)
Average daily hot water use (litres/day)												93.4916 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	102.8407	99.1011	95.3614	91.6217	87.8821	84.1424	84.1424	87.8821	91.6217	95.3614	99.1011	102.8407 (44)
Energy content (annual)	152.5098	133.3861	137.6425	120.0000	115.1429	99.3596	92.0712	105.6531	106.9149	124.5990	136.0096	147.6976 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1470.9864 (45)

	22.8765	20.0079	20.6464	18.0000	17.2714	14.9039	13.8107	15.8480	16.0372	18.6899	20.4014	22.1546 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	0.6702	0.5948	0.5907	0.4948	0.4554	0.3762	0.3486	0.4178	0.4408	0.5347	0.6065	0.6490 (61)
Total heat required for water heating calculated for each month	153.1800	133.9809	138.2331	120.4948	115.5983	99.7358	92.4199	106.0709	107.3557	125.1337	136.6161	148.3467 (62)
WWHRS	-49.4854	-43.5394	-44.4384	-36.5722	-33.9630	-28.0213	-23.7216	-28.7193	-29.5543	-36.5280	-42.3034	-47.8278 eq. (G10)
Total of WWHRS savings												-444.6741
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	103.6946	90.4415	93.7947	83.9226	81.6353	71.7145	68.6982	77.3516	77.8015	88.6057	94.3127	100.5189 (64)
Heat gains from water heating, kWh/month	50.8771	44.4996	45.9138	40.0237	38.3989	33.1311	30.7008	35.2341	35.6594	41.5629	45.3748	49.2717 (65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.8308	49.5885	40.3280	30.5309	22.8222	19.2675	20.8192	27.0616	36.3220	46.1191	53.8278	57.3825 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	333.1376	336.5945	327.8832	309.3378	285.9275	263.9252	249.2263	245.7693	254.4807	273.0261	296.4364	318.4387 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595 (71)
Water heating gains (Table 5)	68.3832	66.2196	61.7121	55.5885	51.6114	46.0154	41.2646	47.3577	49.5270	55.8641	63.0206	66.2254 (72)
Total internal gains	562.7568	557.8078	535.3285	500.8623	465.7663	434.6133	416.7152	425.5938	445.7348	480.4144	518.6899	547.4518 (73)

[Jan					Area	Solar flux	g	FF			Access	Gains
					m2	Table 6a	Specific data	Specific data			factor	W
						W/m2	or Table 6b	or Table 6c			Table 6d	
East					2.7240	25.1733	0.7300	0.7200			0.7700	24.9767 (76)
West					6.3550	25.1733	0.7300	0.7200			0.7700	58.2698 (80)

Solar gains	83.2465	138.5284	231.5197	339.2055	391.1705	441.8227	406.6628	364.3931	283.3910	179.4571	103.4588	67.2903 (83)
Total gains	646.0033	696.3361	766.8482	840.0678	856.9367	876.4360	823.3780	789.9868	729.1258	659.8715	622.1487	614.7421 (84)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, n11,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	15.5107	15.6393	15.6808	15.8011	15.8011	15.8397	15.8397	15.8776	15.8776	15.7617	15.7617	15.7216
alpha	2.0340	2.0426	2.0454	2.0534	2.0534	2.0560	2.0560	2.0585	2.0585	2.0508	2.0508	2.0481
util living area	0.8881	0.8689	0.8229	0.7425	0.6301	0.4677	0.3485	0.3510	0.5580	0.7477	0.8503	0.8944 (86)
MIT	18.5328	18.7441	19.2380	19.8604	20.4120	20.7893	20.9225	20.9241	20.6805	20.0740	19.2612	18.5314 (87)
Th 2	19.9253	19.9331	19.9357	19.9429	19.9429	19.9452	19.9452	19.9474	19.9474	19.9405	19.9405	19.9381 (88)
util rest of house	0.8750	0.8539	0.8020	0.7106	0.5795	0.3913	0.2484	0.2472	0.4832	0.7073	0.8299	0.8820 (89)
MIT 2	16.7187	17.0192	17.7155	18.5799	19.3163	19.7726	19.9051	19.9096	19.6638	18.8900	17.7635	16.7222 (90)
Living area fraction												0.1678 (91)
MIT	17.0231	17.3086	17.9710	18.7948	19.5002	19.9432	20.0758	20.0799	19.8344	19.0887	18.0148	17.0258 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.8731	17.1586	17.8210	18.6448	19.3502	19.7932	19.9258	19.9299	19.6844	18.9387	17.8648	16.8758 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8235	0.8011	0.7490	0.6639	0.5474	0.3794	0.2464	0.2453	0.4623	0.6608	0.7767	0.8316 (94)
Useful gains	532.0087	557.8595	574.3339	557.7471	469.0685	332.5341	202.8932	193.7998	337.0529	436.0264	483.2282	511.2383 (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	1091.0044	1070.9471	977.5539	819.0281	599.0871	372.2610	212.8272	203.1662	399.1465	637.9125	871.0442	1066.9950 (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	415.8928	344.7949	299.9957	188.1223	96.7338	0.0000	0.0000	0.0000	0.0000	150.2033	279.2275	413.4830 (98)
Space heating												2188.4532 (98)
Space heating per m2												26.7472 (99)
										(98) / (4) =		

Regs Region: England
Elmhurst Energy Systems
SAP2012 Calculator (Design
System) version 4.14r19

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2426.2231 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	415.8928	344.7949	299.9957	188.1223	96.7338	0.0000	0.0000	0.0000	0.0000	150.2033	279.2275	413.4830	(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)	461.0785	382.2560	332.5894	208.5613	107.2437	0.0000	0.0000	0.0000	0.0000	166.5225	309.5649	458.4068	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	103.6946	90.4415	93.7947	83.9226	81.6353	71.7145	68.6982	77.3516	77.8015	88.6057	94.3127	100.5189	(64)
Efficiency of water heater (217)m	87.0616	86.9369	86.4794	85.4392	83.3126	76.4000	76.4000	76.4000	76.4000	84.5346	86.2658	76.4000	(216)
Fuel for water heating, kWh/month	119.1049	104.0312	108.4590	98.2250	97.9867	93.8672	89.9191	101.2456	101.8344	104.8159	109.3281	115.3765	(219)
Water heating fuel used												1244.1936	(219)
Annual totals kWh/year													
Space heating fuel - main system												2426.2231	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												394.3960	(232)
Total delivered energy for all uses												4139.8126	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2426.2231	5.9600	144.6029 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1244.1936	5.9600	74.1539 (247)
Pumps and fans for heating	75.0000	25.0500	18.7875 (249)
Energy for lighting	394.3960	25.0500	98.7962 (250)
Additional standing charges			112.0000 (251)
Total energy cost			448.3405 (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	2426.2231	0.2160	524.0642 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1244.1936	0.2160	268.7458 (264)
Space and water heating			792.8100 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	394.3960	0.5190	204.6915 (268)
Total kg/year			1036.4265 (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	2426.2231	1.2200	2959.9921 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1244.1936	1.2200	1517.9162 (264)
Space and water heating			4477.9083 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	394.3960	3.0700	1210.7958 (268)
Primary energy kWh/year			5918.9541 (272)
Primary energy kWh/m2/year			72.3412 (273)

SAP 2012 EPC IMPROVEMENTS

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

(For testing purposes):

A		Not considered
B		Not considered
C		Not considered
D		Not considered
E	Low energy lighting	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	+ 10.5	-£ 488	-1010 kg (97.5%)

Measures omitted - SAP change or cost saving too small:

N Solar water heating	+ 0.9	-£ 34	-143 kg (13.8%)
-----------------------	-------	-------	-----------------

Recommended measures	Typical annual savings		Energy efficiency	Environmental impact
Solar photovoltaic panels	£488	12.35 kg/m²	A 95	A 97
Total Savings	£488	12.35 kg/m²		
Potential energy efficiency rating:			A 95	
Potential environmental impact rating:				A 97

Fuel prices for cost data on this page from database revision number 553 TEST (30 Sep 2024)
Recommendation texts revision number 4.9c (22 Feb 2014)

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

	Current	Potential	Saving
Electricity	£118	£118	£0
Mains gas	£331	£331	£0
Space heating	£275	£275	£0
Water heating	£74	£74	£0
Lighting	£99	£99	£0
Generated (PV)	-£0	-£488	£488
Total cost of fuels	£449	-£39	£488
Total cost of uses	£448	-£40	£488
Delivered energy	51 kWh/m²	27 kWh/m²	24 kWh/m²
Carbon dioxide emissions	1.0 tonnes	0.0 tonnes	1.0 tonnes
CO2 emissions per m²	13 kg/m²	0 kg/m²	12 kg/m²
Primary energy	72 kWh/m²	-1 kWh/m²	73 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	40.9100 (1b)	x 2.3700 (2b)	= 96.9567 (1b) - (3b)
First floor	40.9100 (1c)	x 2.6200 (2c)	= 107.1842 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.8200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 204.1409 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1470 (8)
Pressure test					Yes
Measured/design AP50					4.9700
Infiltration rate					0.3955 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3658 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4664	0.4572	0.4481	0.4024	0.3932	0.3475	0.3475	0.3384	0.3658	0.3932	0.4115	0.4298 (22b)
Effective ac	0.6088	0.6045	0.6004	0.5810	0.5773	0.5604	0.5604	0.5572	0.5669	0.5773	0.5847	0.5924 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Solid Door			2.0900	1.2000	2.5080		(26)
Windows (Uw = 1.40)			9.0800	1.3258	12.0379		(27)
Flr - Ground			40.9120	0.1800	7.3642	75.6000	3092.9472 (28a)
Wl - Brick (Timber Frame)	90.3710	11.1690	79.2020	0.2100	16.6324	7.4000	586.0948 (29a)
Rf - Ins Joist	40.9120		40.9120	0.0800	3.2730	7.4000	302.7488 (30)
Total net area of external elements Aum(A, m ²)			172.1960				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.8154		(33)
Party Wall			46.2040	0.0000	0.0000	7.4000	341.9096 (32)
Stud			70.7018			7.4000	523.1936 (32c)
Internal Floor			40.9120			7.4000	302.7488 (32d)
Internal Ceiling			40.9120			7.4000	302.7488 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 5452.3916 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							66.6389 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.3835 (36)
Total fabric heat loss							(33) + (36) = 57.1989 (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	41.0101	40.7256	40.4467	39.1368	38.8918	37.7509	37.7509	37.5396	38.1903	38.8918	39.3875	39.9059 (38)
Heat transfer coeff	98.2090	97.9245	97.6456	96.3358	96.0907	94.9498	94.9498	94.7386	95.3893	96.0907	96.5865	97.1048 (39)
Average = Sum(39)m / 12 =												96.3346 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2003	1.1968	1.1934	1.1774	1.1744	1.1605	1.1605	1.1579	1.1658	1.1744	1.1805	1.1868 (40)
HLP (average)												1.1774 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4965 (42)
Average daily hot water use (litres/day)												93.4916 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	102.8407	99.1011	95.3614	91.6217	87.8821	84.1424	84.1424	87.8821	91.6217	95.3614	99.1011	102.8407 (44)
Energy conte	152.5098	133.3861	137.6425	120.0000	115.1429	99.3596	92.0712	105.6531	106.9149	124.5990	136.0096	147.6976 (45)
Energy content (annual)												Total = Sum(45)m = 1470.9864 (45)
Distribution loss (46)m = 0.15 x (45)m												

	22.8765	20.0079	20.6464	18.0000	17.2714	14.9039	13.8107	15.8480	16.0372	18.6899	20.4014	22.1546 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	0.6702	0.5948	0.5907	0.4948	0.4554	0.3762	0.3486	0.4178	0.4408	0.5347	0.6065	0.6490 (61)
Total heat required for water heating calculated for each month	153.1800	133.9809	138.2331	120.4948	115.5983	99.7358	92.4199	106.0709	107.3557	125.1337	136.6161	148.3467 (62)
WWHRS	-49.4854	-43.5394	-44.4384	-36.5722	-33.9630	-28.0213	-23.7216	-28.7193	-29.5543	-36.5280	-42.3034	-47.8278 eq. (G10)
Total of WWHRS savings												-444.6741
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	103.6946	90.4415	93.7947	83.9226	81.6353	71.7145	68.6982	77.3516	77.8015	88.6057	94.3127	100.5189 (64)
Heat gains from water heating, kWh/month	50.8771	44.4996	45.9138	40.0237	38.3989	33.1311	30.7008	35.2341	35.6594	41.5629	45.3748	49.2717 (65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.8308	49.5885	40.3280	30.5309	22.8222	19.2675	20.8192	27.0616	36.3220	46.1191	53.8278	57.3825 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	333.1376	336.5945	327.8832	309.3378	285.9275	263.9252	249.2263	245.7693	254.4807	273.0261	296.4364	318.4387 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595 (71)
Water heating gains (Table 5)	68.3832	66.2196	61.7121	55.5885	51.6114	46.0154	41.2646	47.3577	49.5270	55.8641	63.0206	66.2254 (72)
Total internal gains	562.7568	557.8078	535.3285	500.8623	465.7663	434.6133	416.7152	425.5938	445.7348	480.4144	518.6899	547.4518 (73)

[Jan					Area	Solar flux	g		FF	Access		Gains
					m2	Table 6a	Specific data		Specific data	factor		W
						W/m2	or Table 6b		or Table 6c	Table 6d		
East					2.7240	19.6403	0.7300		0.7200	0.7700		19.4869 (76)
West					6.3550	19.6403	0.7300		0.7200	0.7700		45.4623 (80)
Solar gains	64.9492	127.0544	209.2406	305.1649	373.9911	382.8464	364.4854	313.0875	243.3555	150.7608	80.9840	53.4111 (83)
Total gains	627.7060	684.8622	744.5691	806.0272	839.7573	817.4596	781.2006	738.6813	689.0902	631.1752	599.6740	600.8629 (84)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nll,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	15.4217	15.4665	15.5107	15.7216	15.7617	15.9511	15.9511	15.9867	15.8776	15.7617	15.6808	15.5971
alpha	2.0281	2.0311	2.0340	2.0481	2.0508	2.0634	2.0634	2.0658	2.0585	2.0508	2.0454	2.0398
util living area	0.9069	0.8870	0.8504	0.7854	0.6929	0.5700	0.4546	0.4885	0.6575	0.8096	0.8836	0.9135 (86)
MIT	18.1378	18.4057	18.9018	19.5621	20.1572	20.6147	20.8297	20.7960	20.4435	19.6799	18.8090	18.0897 (87)
Th 2	19.1918	19.9225	19.9253	19.9381	19.9405	19.9518	19.9518	19.9538	19.9474	19.9405	19.9357	19.9306 (88)
util rest of house	0.8966	0.8745	0.8333	0.7594	0.6523	0.5066	0.3670	0.4020	0.5998	0.7810	0.8687	0.9039 (89)
MIT 2	16.1518	16.5332	17.2376	18.1679	18.9817	19.5800	19.8268	19.7966	19.3776	18.3512	17.1202	16.0865 (90)
Living area fraction									fLA = Living area / (4) =			0.1678 (91)
MIT	16.4851	16.8474	17.5169	18.4019	19.1789	19.7536	19.9951	19.9643	19.5565	18.5742	17.4036	16.4227 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.3351	16.6974	17.3669	18.2519	19.0289	19.6036	19.8451	19.8143	19.4065	18.4242	17.2536	16.2727 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8477	0.8229	0.7797	0.7085	0.6116	0.4832	0.3572	0.3893	0.5654	0.7289	0.8170	0.8565 (94)
Useful gains	532.0819	563.5801	580.5211	571.0832	513.5663	394.9588	279.0784	287.5893	389.5972	460.0748	489.9498	514.6337 (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	1181.9544	1155.2548	1061.1050	900.9186	704.2415	475.0940	308.1240	323.4631	506.1805	751.8321	980.6994	1172.3146 (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	483.5052	397.6054	357.5544	237.4815	141.8623	0.0000	0.0000	0.0000	0.0000	217.0675	353.3397	489.3145 (98)
Space heating												2677.7305 (98)
Space heating per m2										(98) / (4) =		32.7271 (99)

Regs Region: England
Elmhurst Energy Systems
SAP2012 Calculator (Design
System) version 4.14r19

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												90.2000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												2968.6591	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	483.5052	397.6054	357.5544	237.4815	141.8623	0.0000	0.0000	0.0000	0.0000	217.0675	353.3397	489.3145	(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)	536.0368	440.8042	396.4017	263.2833	157.2753	0.0000	0.0000	0.0000	0.0000	240.6513	391.7292	542.4773	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	103.6946	90.4415	93.7947	83.9226	81.6353	71.7145	68.6982	77.3516	77.8015	88.6057	94.3127	100.5189	(64)
Efficiency of water heater (217)m	87.4118	87.2785	86.9367	86.1374	84.6172	76.4000	76.4000	76.4000	76.4000	85.7122	86.8933	76.4000	(216)
Fuel for water heating, kWh/month	118.6277	103.6239	107.8885	97.4288	96.4760	93.8672	89.9191	101.2456	101.8344	103.3758	108.5386	114.8704	(219)
Water heating fuel used												1237.6961	(219)
Annual totals kWh/year													
Space heating fuel - main system												2968.6591	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												394.3960	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 2.50 * 1080 * 0.80) =										-1727.2394		-1727.2394	(233)
Total delivered energy for all uses												2948.5118	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2968.6591	3.4800	103.3093 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1237.6961	3.4800	43.0718 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	394.3960	13.1900	52.0208 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-1727.2394	13.1900	-227.8229 (252)
Total energy cost			100.4716 (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] =	0.3327 (257)
SAP value	95.3583	
SAP rating (Section 12)	95	(258)
SAP band	A	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2968.6591	0.2160	641.2304	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1237.6961	0.2160	267.3424	(264)
Space and water heating			908.5727	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	394.3960	0.5190	204.6915	(268)
Energy saving/generation technologies				
PV Unit	-1727.2394	0.5190	-896.4372	(269)
Total kg/year			255.7520	(272)
CO2 emissions per m2			3.1300	(273)
EI value			97.2977	
EI rating			97	(274)
EI band			A	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	40.9100 (1b)	x 2.3700 (2b)	= 96.9567 (1b) - (3b)
First floor	40.9100 (1c)	x 2.6200 (2c)	= 107.1842 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.8200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 204.1409 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1470 (8)
Pressure test					Yes
Measured/design AP50					4.9700
Infiltration rate					0.3955 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3658 (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	0.4481	0.4207	0.4115	0.3841	0.3841	0.3749	0.3749	0.3658	0.3658	0.3932	0.3932	0.4024 (22b)
Effective ac	0.6004	0.5885	0.5847	0.5738	0.5738	0.5703	0.5703	0.5669	0.5669	0.5773	0.5773	0.5810 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Solid Door			2.0900	1.2000	2.5080		(26)
Windows (Uw = 1.40)			9.0800	1.3258	12.0379		(27)
Flr - Ground			40.9120	0.1800	7.3642	75.6000	3092.9472 (28a)
Wl - Brick (Timber Frame)	90.3710	11.1690	79.2020	0.2100	16.6324	7.4000	586.0948 (29a)
Rf - Ins Joist	40.9120		40.9120	0.0800	3.2730	7.4000	302.7488 (30)
Total net area of external elements Aum(A, m ²)			172.1960				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.8154		(33)
Party Wall			46.2040	0.0000	0.0000	7.4000	341.9096 (32)
Stud			70.7018			7.4000	523.1936 (32c)
Internal Floor			40.9120			7.4000	302.7488 (32d)
Internal Ceiling			40.9120			7.4000	302.7488 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.4467	39.6439	39.3875	38.6523	38.6523	38.4185	38.4185	38.1903	38.1903	38.8918	38.8918	39.1368 (38)
Heat transfer coeff	97.6456	96.8428	96.5865	95.8512	95.8512	95.6174	95.6174	95.3893	95.3893	96.0907	96.0907	96.3358 (39)
Average = Sum(39)m / 12 =												96.1090 (39)
HLP	1.1934	1.1836	1.1805	1.1715	1.1715	1.1686	1.1686	1.1658	1.1658	1.1744	1.1744	1.1774 (40)
HLP (average)												1.1746 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4965 (42)
Average daily hot water use (litres/day)												93.4916 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	102.8407	99.1011	95.3614	91.6217	87.8821	84.1424	84.1424	87.8821	91.6217	95.3614	99.1011	102.8407 (44)
Energy content (annual)	152.5098	133.3861	137.6425	120.0000	115.1429	99.3596	92.0712	105.6531	106.9149	124.5990	136.0096	147.6976 (45)
Distribution loss (46)m = 0.15 x (45)m												1470.9864 (45)

	22.8765	20.0079	20.6464	18.0000	17.2714	14.9039	13.8107	15.8480	16.0372	18.6899	20.4014	22.1546 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	0.6702	0.5948	0.5907	0.4948	0.4554	0.3762	0.3486	0.4178	0.4408	0.5347	0.6065	0.6490 (61)
Total heat required for water heating calculated for each month	153.1800	133.9809	138.2331	120.4948	115.5983	99.7358	92.4199	106.0709	107.3557	125.1337	136.6161	148.3467 (62)
WWHRS	-49.4854	-43.5394	-44.4384	-36.5722	-33.9630	-28.0213	-23.7216	-28.7193	-29.5543	-36.5280	-42.3034	-47.8278 eq. (G10)
Total of WWHRS savings												-444.6741
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	103.6946	90.4415	93.7947	83.9226	81.6353	71.7145	68.6982	77.3516	77.8015	88.6057	94.3127	100.5189 (64)
Heat gains from water heating, kWh/month	50.8771	44.4996	45.9138	40.0237	38.3989	33.1311	30.7008	35.2341	35.6594	41.5629	45.3748	49.2717 (65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.8308	49.5885	40.3280	30.5309	22.8222	19.2675	20.8192	27.0616	36.3220	46.1191	53.8278	57.3825 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	333.1376	336.5945	327.8832	309.3378	285.9275	263.9252	249.2263	245.7693	254.4807	273.0261	296.4364	318.4387 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595 (71)
Water heating gains (Table 5)	68.3832	66.2196	61.7121	55.5885	51.6114	46.0154	41.2646	47.3577	49.5270	55.8641	63.0206	66.2254 (72)
Total internal gains	562.7568	557.8078	535.3285	500.8623	465.7663	434.6133	416.7152	425.5938	445.7348	480.4144	518.6899	547.4518 (73)

[Jan					Area	Solar flux	g		FF	Access		Gains
					m2	Table 6a	Specific data		Specific data	factor		W
						W/m2	or Table 6b		or Table 6c	Table 6d		
East					2.7240	25.1733	0.7300		0.7200	0.7700		54.9767 (76)
West					6.3550	25.1733	0.7300		0.7200	0.7700		28.2698 (80)
Solar gains	83.2465	138.5284	231.5197	339.2055	391.1705	441.8227	406.6628	364.3931	283.3910	179.4571	103.4588	67.2903 (83)
Total gains	646.0033	696.3361	766.8482	840.0678	856.9367	876.4360	823.3780	789.9868	729.1258	659.8715	622.1487	614.7421 (84)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, n11,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	15.5107	15.6393	15.6808	15.8011	15.8011	15.8397	15.8397	15.8776	15.8776	15.7617	15.7617	15.7216
alpha	2.0340	2.0426	2.0454	2.0534	2.0534	2.0560	2.0560	2.0585	2.0585	2.0508	2.0508	2.0481
util living area												
	0.8881	0.8689	0.8229	0.7425	0.6301	0.4677	0.3485	0.3510	0.5580	0.7477	0.8503	0.8944 (86)
MIT	18.5328	18.7441	19.2380	19.8604	20.4120	20.7893	20.9225	20.9241	20.6805	20.0740	19.2612	18.5314 (87)
Th 2	19.9253	19.9331	19.9357	19.9429	19.9429	19.9452	19.9452	19.9474	19.9474	19.9405	19.9405	19.9381 (88)
util rest of house												
	0.8750	0.8539	0.8020	0.7106	0.5795	0.3913	0.2484	0.2472	0.4832	0.7073	0.8299	0.8820 (89)
MIT 2	16.7187	17.0192	17.7155	18.5799	19.3163	19.7726	19.9051	19.9096	19.6638	18.8900	17.7635	16.7222 (90)
Living area fraction												
MIT	17.0231	17.3086	17.9710	18.7948	19.5002	19.9432	20.0758	20.0799	19.8344	19.0887	18.0148	17.0258 (91)
Temperature adjustment												
adjusted MIT	16.8731	17.1586	17.8210	18.6448	19.3502	19.7932	19.9258	19.9299	19.6844	18.9387	17.8648	16.8758 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8235	0.8011	0.7490	0.6639	0.5474	0.3794	0.2464	0.2453	0.4623	0.6608	0.7767	0.8316 (94)
Useful gains	532.0087	557.8595	574.3339	557.7471	469.0685	332.5341	202.8932	193.7998	337.0529	436.0264	483.2282	511.2383 (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	1091.0044	1070.9471	977.5539	819.0281	599.0871	372.2610	212.8272	203.1662	399.1465	637.9125	871.0442	1066.9950 (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	415.8928	344.7949	299.9957	188.1223	96.7338	0.0000	0.0000	0.0000	0.0000	150.2033	279.2275	413.4830 (98)
Space heating												2188.4532 (98)
Space heating per m2												26.7472 (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												2426.2231	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	415.8928	344.7949	299.9957	188.1223	96.7338	0.0000	0.0000	0.0000	0.0000	150.2033	279.2275	413.4830	(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)	461.0785	382.2560	332.5894	208.5613	107.2437	0.0000	0.0000	0.0000	0.0000	166.5225	309.5649	458.4068	(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	103.6946	90.4415	93.7947	83.9226	81.6353	71.7145	68.6982	77.3516	77.8015	88.6057	94.3127	100.5189	(64)
Efficiency of water heater	87.0616	86.9369	86.4794	85.4392	83.3126	76.4000	76.4000	76.4000	76.4000	84.5346	86.2658	76.4000	(216)
(217)m	87.0616	86.9369	86.4794	85.4392	83.3126	76.4000	76.4000	76.4000	76.4000	84.5346	86.2658	87.1225	(217)
Fuel for water heating, kWh/month	119.1049	104.0312	108.4590	98.2250	97.9867	93.8672	89.9191	101.2456	101.8344	104.8159	109.3281	115.3765	(219)
Water heating fuel used												1244.1936	(219)
Annual totals kWh/year													
Space heating fuel - main system												2426.2231	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												394.3960	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 2.50 * 1217 * 0.80) =										-1946.4459		-1946.4459	(233)
Total delivered energy for all uses												2193.3667	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2426.2231	5.9600	144.6029 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1244.1936	5.9600	74.1539 (247)
Pumps and fans for heating	75.0000	25.0500	18.7875 (249)
Energy for lighting	394.3960	25.0500	98.7962 (250)
Additional standing charges			112.0000 (251)
Energy saving/generation technologies			
PV Unit	-1946.4459	25.0500	-487.5847 (252)
Total energy cost			-39.2442 (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	2426.2231	0.2160	524.0642 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1244.1936	0.2160	268.7458 (264)
Space and water heating			792.8100 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	394.3960	0.5190	204.6915 (268)
Energy saving/generation technologies			
PV Unit	-1946.4459	0.5190	-1010.2054 (269)
Total kg/year			26.2211 (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	2426.2231	1.2200	2959.9921 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1244.1936	1.2200	1517.9162 (264)
Space and water heating			4477.9083 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	394.3960	3.0700	1210.7958 (268)
Energy saving/generation technologies			
PV Unit	-1946.4459	3.0700	-5975.5890 (269)
Primary energy kWh/year			-56.6350 (272)
Primary energy kWh/m2/year			-0.6922 (273)

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Built)

Property Reference	055 - PRJ013014	Issued on Date	21/10/2024
Assessment Reference	055	Prop Type Ref	2B
Property	18 Erwood Close, Netley Abbey, Southampton, SO31 5TJ		
SAP Rating	85 B	DER	15.12
Environmental	88 B	TER	18.35
CO ₂ Emissions (t/year)	1.04	% DER<TER	17.59
General Requirements Compliance	Pass	DfEE	45.71
		TfEE	50.80
		% DfEE<TfEE	10.02
Assessor Details	Mr. Christopher Nicholls, Briary Energy Limited, Tel: 0203 397 1373, chris@briaryenergy.co.uk		Assessor ID
			U903-0001
Client			

SUMMARY FOR INPUT DATA FOR New Build (As Built)

Criterion 1 – Achieving the TER and TfEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	18.35	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	15.12	kgCO ₂ /m ²	Pass
	-3.23 (-17.6%)	kgCO ₂ /m ²	

1b TfEE and DfEE

Target Fabric Energy Efficiency (TfEE)	50.80	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DfEE)	45.71	kWh/m ² /yr	
	-5.1 (-10.0%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.21 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.18 (max. 0.25)	0.18 (max. 0.70)	Pass
Roof	0.08 (max. 0.20)	0.08 (max. 0.35)	Pass
Openings	1.36 (max. 2.00)	1.40 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.97 (measured in this dwelling)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Built)

Main heating system

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

Pass

Secondary heating system

None

5 Cylinder insulation

Hot water storage

No cylinder

6 Controls

Space heating controls

Time and temperature zone control

Pass

Hot water controls

No cylinder

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100

%

Minimum

75

%

Pass

8 Mechanical ventilation

Not applicable

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Southern England)

Slight

Pass

Based on:

Overshading

Average

Windows facing East

2.72 m², No overhang

Windows facing West

6.36 m², No overhang

Air change rate

4.67 ach

Blinds/curtains

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

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

4.97 (measured in this dwelling)

Maximum

10.0

Pass

10 Key features

Party wall U-value

0.00

W/m²K

Roof U-value

0.08

W/m²K

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