

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

Property Reference	048 - PRJ013014	Issued on Date	09/05/2024
Assessment Reference	048	Prop Type Ref	2B
Property	1 Rashleigh Drive, Netley Abbey, Southampton, SO31 5JY		

SAP Rating	85 B	DER	15.20	TER	18.54
Environmental	88 B	% DER<TER	18.04		
CO ₂ Emissions (t/year)	1.05	DFEE	46.12	TFEE	51.95
General Requirements Compliance	Pass	% DFEE<TFEE	11.22		

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	41.0800 (1b)	x 2.3700 (2b)	= 97.3596 (1b) - (3b)
First floor	41.0800 (1c)	x 2.6200 (2c)	= 107.6296 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	82.1600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 204.9892 (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) =	0.1463 (8)			
Pressure test								Yes				
Measured/design AP50									4.7800			
Infiltration rate									0.3853 (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) =	0.3564 (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	0.4366	0.4099	0.4010	0.3743	0.3743	0.3654	0.3654	0.3564	0.3564	0.3832	0.3832	0.3921 (22b)
Effective ac	0.5953	0.5840	0.5804	0.5700	0.5700	0.5667	0.5667	0.5635	0.5635	0.5734	0.5734	0.5769 (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)			9.8900	1.3258	13.1117		(27)
Flr - Ground			41.0820	0.1800	7.3948	75.6000	3105.7992 (28a)
Wl - Brick (Timber Frame)	90.5550	11.9790	78.5760	0.2100	16.5010	7.4000	581.4624 (29a)
Rf - Ins Joist	41.0820		41.0820	0.0800	3.2866	7.4000	304.0068 (30)
Total net area of external elements Aum(A, m ²)			172.7200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	42.8020		(33)
Party Wall			46.2060	0.0000	0.0000	7.4000	341.9244 (32)
Stud			70.8677			7.4000	524.4213 (32c)
Internal Floor			41.0820			7.4000	304.0068 (32d)
Internal Ceiling			41.0820			7.4000	304.0068 (32e)
Heat capacity Cm = Sum (A x k)							(28)...(30) + (32) + (32a)...(32e) = 5465.6277 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							66.5242 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.6210 (36)
Total fabric heat loss							(33) + (36) = 58.4230 (37)

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

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(38)m	Jan 40.2720	Feb 39.5065	Mar 39.2621	Apr 38.5611	May 38.5611	Jun 38.3382	Jul 38.3382	Aug 38.1206	Sep 38.1206	Oct 38.7894	Nov 38.7894	Dec 39.0231	(38)
Heat transfer coeff	98.6950	97.9296	97.6852	96.9841	96.9841	96.7612	96.7612	96.5437	96.5437	97.2124	97.2124	97.4461	(39)
Average = Sum(39)m / 12 =												97.2299	(39)
HLP	Jan 1.2013	Feb 1.1919	Mar 1.1890	Apr 1.1804	May 1.1804	Jun 1.1777	Jul 1.1777	Aug 1.1751	Sep 1.1751	Oct 1.1832	Nov 1.1832	Dec 1.1861	(40)
HLP (average)												1.1834	(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													2.5026	(42)	
Average daily hot water use (litres/day)													93.6360	(43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Daily hot water use	102.9996	99.2542	95.5087	91.7633	88.0178	84.2724	84.2724	88.0178	91.7633	95.5087	99.2542	102.9996	(44)		
Energy conte	152.7454	133.5921	137.8551	120.1854	115.3208	99.5131	92.2135	105.8163	107.0801	124.7915	136.2197	147.9258	(45)		
Energy content (annual)													Total = Sum(45)m =	1473.2589	(45)
Distribution loss (46)m = 0.15 x (45)m	22.9118	20.0388	20.6783	18.0278	17.2981	14.9270	13.8320	15.8724	16.0620	18.7187	20.4330	22.1889	(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	0.5967	0.5925	0.4963	0.4568	0.3774	0.3497	0.4191	0.4422	0.5363	0.6084	0.6491	(61)		
Total heat required for water heating calculated for each month	153.4157	134.1888	138.4476	120.6817	115.7775	99.8904	92.5632	106.2354	107.5223	125.3279	136.8281	148.5749	(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	153.4157	134.1888	138.4476	120.6817	115.7775	99.8904	92.5632	106.2354	107.5223	125.3279	136.8281	148.5749	(64)		
													Total per year (kWh/year) = Sum(64)m =	1479.4536	(64)
RHI water heating demand															
Heat gains from water heating, kWh/month	50.9554	44.5686	45.9849	40.0857	38.4583	33.1824	30.7484	35.2887	35.7147	41.6273	45.4452	49.3476	(65)		

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

Metabolic gains (Table 5), Watts	Jan 150.1541	Feb 150.1541	Mar 150.1541	Apr 150.1541	May 150.1541	Jun 150.1541	Jul 150.1541	Aug 150.1541	Sep 150.1541	Oct 150.1541	Nov 150.1541	Dec 150.1541	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.0069	48.8566	39.7329	30.0803	22.4854	18.9831	20.5119	26.6622	35.7859	45.4385	53.0334	56.5357	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	334.1725	337.6402	328.9018	310.2988	286.8158	264.7451	250.0005	246.5328	255.2712	273.8743	297.3573	319.4279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.5180	52.5180	52.5180	52.5180	52.5180	52.5180	52.5180	52.5180	52.5180	52.5180	52.5180	52.5180	(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)	-100.1027	-100.1027	-100.1027	-100.1027	-100.1027	-100.1027	-100.1027	-100.1027	-100.1027	-100.1027	-100.1027	-100.1027	(71)
Water heating gains (Table 5)	68.4885	66.3223	61.8077	55.6746	51.6913	46.0867	41.3285	47.4311	49.6037	55.9506	63.1183	66.3274	(72)
Total internal gains	563.2372	558.3884	536.0117	501.6231	466.5619	435.3843	417.4103	426.1954	446.2302	480.8327	519.0783	547.8604	(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
North				7.1650	13.4684	0.7300	0.7200	0.7700		35.1497
South				2.7240	56.5862	0.7300	0.7200	0.7700		56.1444
Solar gains	91.2941	135.8476	202.2906	280.7799	324.2827	369.7974	338.7653	300.6764	240.1646	167.4725
Total gains	654.5313	694.2360	738.3024	782.4030	790.8445	805.1817	756.1756	726.8718	686.3949	648.3052
										109.6328
										76.4518
										(83)
										624.3122
										(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	15.3830	15.5033	15.5421	15.6544	15.6544	15.6905	15.6905	15.7258	15.7258	15.6177	15.6177	15.5802	
alpha	2.0255	2.0336	2.0361	2.0436	2.0436	2.0460	2.0460	2.0484	2.0484	2.0412	2.0412	2.0387	
util living area	0.8868	0.8707	0.8335	0.7658	0.6607	0.5004	0.3772	0.3793	0.5829	0.7553	0.8495	0.8928 (86)	
MIT	18.5245	18.7148	19.1692	19.7694	20.3454	20.7564	20.9083	20.9105	20.6474	20.0443	19.2504	18.5238 (87)	
Th 2	19.9190	19.9265	19.9288	19.9357	19.9357	19.9379	19.9379	19.9400	19.9400	19.9335	19.9335	19.9312 (88)	
util rest of house	0.8736	0.8557	0.8133	0.7353	0.6107	0.4213	0.2702	0.2684	0.5072	0.7153	0.8289	0.8802 (89)	
MIT 2	16.7053	16.9763	17.6191	18.4576	19.2332	19.7366	19.8900	19.8950	19.6248	18.8484	17.7458	16.7096 (90)	
Living area fraction													fLA = Living area / (4) = 0.1671 (91)

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MIT	17.0093	17.2668	17.8781	18.6768	19.4190	19.9070	20.0602	20.0647	19.7957	19.0483	17.9972	17.0127 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.8593	17.1168	17.7281	18.5268	19.2690	19.7570	19.9102	19.9147	19.6457	18.8983	17.8472	16.8627 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8217	0.8028	0.7597	0.6860	0.5745	0.4065	0.2672	0.2656	0.4833	0.6676	0.7753	0.8293 (94)	
Useful gains	537.8061	557.3064	560.8563	536.7019	454.3706	327.2734	202.0348	193.0387	331.7364	432.8065	487.4695	517.7672 (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													
1101.3676	1078.8698	979.6000	817.2694	598.2988	373.2086	213.8628	204.1631	400.2403	641.4326	879.5004	1078.0203 (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													
419.2897	350.4907	311.5453	202.0086	107.0826	0.0000	0.0000	0.0000	0.0000	155.2178	282.2623	416.8283 (98)		
Space heating												2244.7253 (98)	
RHI space heating demand												2245 (98)	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	41.0800 (1b)	x 2.3700 (2b)	= 97.3596 (1b) - (3b)
First floor	41.0800 (1c)	x 2.6200 (2c)	= 107.6296 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	82.1600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 204.9892 (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) = 0.1463 (8)
Pressure test					Yes
Measured/design AP50					4.7800
Infiltration rate					0.3853 (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) =	0.3564 (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	0.4545	0.4456	0.4366	0.3921	0.3832	0.3386	0.3386	0.3297	0.3564	0.3832	0.4010	0.4188 (22b)
Effective ac	0.6033	0.5993	0.5953	0.5769	0.5734	0.5573	0.5573	0.5544	0.5635	0.5734	0.5804	0.5877 (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)			9.8900	1.3258	13.1117		(27)
Flr - Ground			41.0820	0.1800	7.3948	75.6000	3105.7992 (28a)
Wl - Brick (Timber Frame)	90.5550	11.9790	78.5760	0.2100	16.5010	7.4000	581.4624 (29a)
Rf - Ins Joist	41.0820		41.0820	0.0800	3.2866	7.4000	304.0068 (30)
Total net area of external elements Aum(A, m ²)			172.7200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	42.8020		(33)
Party Wall			46.2060	0.0000	0.0000	7.4000	341.9244 (32)
Stud			70.8677			7.4000	524.4213 (32c)
Internal Floor			41.0820			7.4000	304.0068 (32d)
Internal Ceiling			41.0820			7.4000	304.0068 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 5465.6277 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							66.5242 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.6210 (36)
Total fabric heat loss							(33) + (36) = 58.4230 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	40.8092	40.5379	40.2720	39.0231	38.7894	37.7016	37.7016	37.5002	38.1206	38.7894	39.2621	39.7563 (38)
Heat transfer coeff	99.2322	98.9610	98.6950	97.4461	97.2124	96.1247	96.1247	95.9232	96.5437	97.2124	97.6852	98.1794 (39)
Average = Sum(39)m / 12 =												97.4450 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2078	1.2045	1.2013	1.1861	1.1832	1.1700	1.1700	1.1675	1.1751	1.1832	1.1890	1.1950 (40)
HLP (average)												1.1860 (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												2.5026 (42)
Average daily hot water use (litres/day)												93.6360 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	102.9996	99.2542	95.5087	91.7633	88.0178	84.2724	84.2724	88.0178	91.7633	95.5087	99.2542	102.9996 (44)
Energy conte	152.7454	133.5921	137.8551	120.1854	115.3208	99.5131	92.2135	105.8163	107.0801	124.7915	136.2197	147.9258 (45)
Energy content (annual)												Total = Sum(45)m = 1473.2589 (45)
Distribution loss (46)m = 0.15 x (45)m												

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	22.9118	20.0388	20.6783	18.0278	17.2981	14.9270	13.8320	15.8724	16.0620	18.7187	20.4330	22.1889 (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	0.5967	0.5925	0.4963	0.4568	0.3774	0.3497	0.4191	0.4422	0.5363	0.6084	0.6491 (61)
Total heat required for water heating calculated for each month	153.4157	134.1888	138.4476	120.6817	115.7775	99.8904	92.5632	106.2354	107.5223	125.3279	136.8281	148.5749 (62)
WWHRS	-49.5882	-43.6299	-44.5308	-36.6478	-34.0330	-28.0789	-23.7702	-28.7782	-29.6150	-36.6034	-42.3910	-47.9272 eq. (G10)
Total of WWHRS savings												-445.5938
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	103.8274	90.5589	93.9168	84.0339	81.7445	71.8115	68.7929	77.4572	77.9073	88.7245	94.4372	100.6477 (64)
Heat gains from water heating, kWh/month	50.9554	44.5686	45.9849	40.0857	38.4583	33.1824	30.7484	35.2887	35.7147	41.6273	45.4452	49.3476 (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	150.1541	150.1541	150.1541	150.1541	150.1541	150.1541	150.1541	150.1541	150.1541	150.1541	150.1541	150.1541	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.0069	48.8566	39.7329	30.0803	22.4854	18.9831	20.5119	26.6622	35.7859	45.4385	53.0334	56.5357	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	334.1725	337.6402	328.9018	310.2988	286.8158	264.7451	250.0005	246.5328	255.2712	273.8743	297.3573	319.4279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.5180	52.5180	52.5180	52.5180	52.5180	52.5180	52.5180	52.5180	52.5180	52.5180	52.5180	52.5180	(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)	-100.1027	-100.1027	-100.1027	-100.1027	-100.1027	-100.1027	-100.1027	-100.1027	-100.1027	-100.1027	-100.1027	-100.1027	(71)
Water heating gains (Table 5)	68.4885	66.3223	61.8077	55.6746	51.6913	46.0867	41.3285	47.4311	49.6037	55.9506	63.1183	66.3274	(72)
Total internal gains	563.2372	558.3884	536.0117	501.6231	466.5619	435.3843	417.4103	426.1954	446.2302	480.8327	519.0783	547.8604	(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		
North				7.1650	10.6334	0.7300	0.7200	0.7700		27.7509 (74)		
South				2.7240	46.7521	0.7300	0.7200	0.7700		46.3870 (78)		

Solar gains	74.1379	129.0033	186.8889	254.1241	308.9661	318.4293	302.0584	258.6957	209.4394	145.0700	89.2187	63.2172 (83)
Total gains	637.3751	687.3917	722.9006	755.7471	775.5280	753.8136	719.4687	684.8912	655.6697	625.9027	608.2970	611.0775 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	15.2998	15.3417	15.3830	15.5802	15.6177	15.7944	15.7944	15.8276	15.7258	15.6177	15.5421	15.4638	
alpha	2.0200	2.0228	2.0255	2.0387	2.0412	2.0530	2.0530	2.0552	2.0484	2.0412	2.0361	2.0309	
util living area	0.9054	0.8873	0.8579	0.8044	0.7211	0.6022	0.4864	0.5186	0.6773	0.8135	0.8821	0.9119	(86)
MIT	18.1319	18.3851	18.8407	19.4689	20.0744	20.5647	20.8030	20.7675	20.4018	19.6531	18.8014	18.0836	(87)
Th 2	19.9138	19.9164	19.9190	19.9312	19.9335	19.9441	19.9441	19.9461	19.9400	19.9335	19.9288	19.9240	(88)
util rest of house	0.8950	0.8748	0.8414	0.7797	0.6817	0.5383	0.3951	0.4294	0.6201	0.7852	0.8671	0.9021	(89)
MIT 2	16.1423	16.5027	17.1512	18.0403	18.8742	19.5206	19.7982	19.7651	19.3246	18.3122	17.1073	16.0766	(90)
Living area fraction	16.4748	16.8173	17.4335	18.2790	19.0748	19.6951	19.9661	19.9326	19.5047	18.5363	17.3904	16.4120	(91)
MIT	16.4748	16.8173	17.4335	18.2790	19.0748	19.6951	19.9661	19.9326	19.5047	18.5363	17.3904	16.4120	(92)
Temperature adjustment	16.3248	16.6673	17.2835	18.1290	18.9248	19.5451	19.8161	19.7826	19.3547	18.3863	17.2404	16.2620	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	538.8910	565.7002	569.3142	549.5934	494.3200	385.1299	275.4621	283.5173	382.2021	458.4679	495.6990	521.9214	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1193.2461	1164.5015	1064.2826	899.3309	702.3384	475.3471	309.1453	324.4739	507.3041	756.9218	990.5694	1184.2404	(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	486.8402	402.3944	368.2565	251.8110	154.7657	0.0000	0.0000	0.0000	0.0000	222.0497	356.3067	492.7653	(98)
Space heating												2735.1897	(98)
Space heating per m2												33.2910	(99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												90.2000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												3032.3610 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	486.8402	402.3944	368.2565	251.8110	154.7657	0.0000	0.0000	0.0000	0.0000	222.0497	356.3067	492.7653 (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)	539.7342	446.1136	408.2667	279.1696	171.5806	0.0000	0.0000	0.0000	0.0000	246.1749	395.0185	546.3030 (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	103.8274	90.5589	93.9168	84.0339	81.7445	71.8115	68.7929	77.4572	77.9073	88.7245	94.4372	100.6477 (64)
Efficiency of water heater (217)m	87.4242	87.3031	87.0064	86.2996	84.8997	76.4000	76.4000	76.4000	76.4000	85.7766	86.9109	76.4000 (216)
Fuel for water heating, kWh/month	118.7628	103.7293	107.9424	97.3746	96.2836	93.9941	90.0431	101.3838	101.9729	103.4367	108.6597	115.0012 (219)
Water heating fuel used												1238.5843 (219)
Annual totals kWh/year												3032.3610 (211)
Space heating fuel - main system												0.0000 (215)
Space heating fuel - secondary												
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)												388.5754 (232)
Total delivered energy for all uses												4734.5208 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3032.3610	3.4800	105.5262 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1238.5843	3.4800	43.1027 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	388.5754	13.1900	51.2531 (250)
Additional standing charges			120.0000 (251)
Total energy cost			329.7745 (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] = 1.0892 (257)
SAP value	84.8054
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	3032.3610	0.2160	654.9900 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1238.5843	0.2160	267.5342 (264)
Space and water heating			922.5242 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	388.5754	0.5190	201.6706 (268)
Total kg/year			1163.1198 (272)
CO2 emissions per m2			14.1600 (273)
EI value			87.7432
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	$3.48 / 0.8323 = 4.181$, stars = 5
Water heating environmental impact	$0.216 / 0.8323 = 0.2595$, 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	41.0800 (1b)	x 2.3700 (2b)	= 97.3596 (1b) - (3b)
First floor	41.0800 (1c)	x 2.6200 (2c)	= 107.6296 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	82.1600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 204.9892 (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) = 0.1463 (8)
Pressure test					Yes
Measured/design AP50					4.7800
Infiltration rate					0.3853 (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) =				0.3564 (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	0.4366	0.4099	0.4010	0.3743	0.3743	0.3654	0.3654	0.3564	0.3564	0.3832	0.3832	0.3921 (22b)
Effective ac	0.5953	0.5840	0.5804	0.5700	0.5700	0.5667	0.5667	0.5635	0.5635	0.5734	0.5734	0.5769 (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)			9.8900	1.3258	13.1117		(27)
Flr - Ground			41.0820	0.1800	7.3948	75.6000	3105.7992 (28a)
Wl - Brick (Timber Frame)	90.5550	11.9790	78.5760	0.2100	16.5010	7.4000	581.4624 (29a)
Rf - Ins Joist	41.0820		41.0820	0.0800	3.2866	7.4000	304.0068 (30)
Total net area of external elements Aum(A, m ²)			172.7200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	42.8020		(33)
Party Wall			46.2060	0.0000	0.0000	7.4000	341.9244 (32)
Stud			70.8677			7.4000	524.4213 (32c)
Internal Floor			41.0820			7.4000	304.0068 (32d)
Internal Ceiling			41.0820			7.4000	304.0068 (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	40.2720	39.5065	39.2621	38.5611	38.5611	38.3382	38.3382	38.1206	38.1206	38.7894	38.7894	39.0231 (38)
Heat transfer coeff	98.6950	97.9296	97.6852	96.9841	96.9841	96.7612	96.7612	96.5437	96.5437	97.2124	97.2124	97.4461 (39)
Average = Sum(39)m / 12 =												97.2299 (39)
HLP	1.2013	1.1919	1.1890	1.1804	1.1804	1.1777	1.1777	1.1751	1.1751	1.1832	1.1832	1.1861 (40)
HLP (average)												1.1834 (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												2.5026 (42)
Average daily hot water use (litres/day)												93.6360 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	102.9996	99.2542	95.5087	91.7633	88.0178	84.2724	84.2724	88.0178	91.7633	95.5087	99.2542	102.9996 (44)
Energy content (annual)	152.7454	133.5921	137.8551	120.1854	115.3208	99.5131	92.2135	105.8163	107.0801	124.7915	136.2197	147.9258 (45)
Distribution loss (46)m = 0.15 x (45)m												1473.2589 (45)

	22.9118	20.0388	20.6783	18.0278	17.2981	14.9270	13.8320	15.8724	16.0620	18.7187	20.4330	22.1889 (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	0.5967	0.5925	0.4963	0.4568	0.3774	0.3497	0.4191	0.4422	0.5363	0.6084	0.6491 (61)
Total heat required for water heating calculated for each month	153.4157	134.1888	138.4476	120.6817	115.7775	99.8904	92.5632	106.2354	107.5223	125.3279	136.8281	148.5749 (62)
WWHRS	-49.5882	-43.6299	-44.5308	-36.6478	-34.0330	-28.0789	-23.7702	-28.7782	-29.6150	-36.6034	-42.3910	-47.9272 eq. (G10)
Total of WWHRS savings												-445.5938
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	103.8274	90.5589	93.9168	84.0339	81.7445	71.8115	68.7929	77.4572	77.9073	88.7245	94.4372	100.6477 (64)
Heat gains from water heating, kWh/month	50.9554	44.5686	45.9849	40.0857	38.4583	33.1824	30.7484	35.2887	35.7147	41.6273	45.4452	49.3476 (65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	150.1541	150.1541	150.1541	150.1541	150.1541	150.1541	150.1541	150.1541	150.1541	150.1541	150.1541	150.1541 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.0069	48.8566	39.7329	30.0803	22.4854	18.9831	20.5119	26.6622	35.7859	45.4385	53.0334	56.5357 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	334.1725	337.6402	328.9018	310.2988	286.8158	264.7451	250.0005	246.5328	255.2712	273.8743	297.3573	319.4279 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.5180	52.5180	52.5180	52.5180	52.5180	52.5180	52.5180	52.5180	52.5180	52.5180	52.5180	52.5180 (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)	-100.1027	-100.1027	-100.1027	-100.1027	-100.1027	-100.1027	-100.1027	-100.1027	-100.1027	-100.1027	-100.1027	-100.1027 (71)
Water heating gains (Table 5)	68.4885	66.3223	61.8077	55.6746	51.6913	46.0867	41.3285	47.4311	49.6037	55.9506	63.1183	66.3274 (72)
Total internal gains	563.2372	558.3884	536.0117	501.6231	466.5619	435.3843	417.4103	426.1954	446.2302	480.8327	519.0783	547.8604 (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			
North				7.1650	13.4684	0.7300		0.7200	0.7700		35.1497 (74)	
South				2.7240	56.5862	0.7300		0.7200	0.7700		56.1444 (78)	
Solar gains	91.2941	135.8476	202.2906	280.7799	324.2827	369.7974	338.7653	300.6764	240.1646	167.4725	109.6328	76.4518 (83)
Total gains	654.5313	694.2360	738.3024	782.4030	790.8445	805.1817	756.1756	726.8718	686.3949	648.3052	628.7110	624.3122 (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	15.3830	15.5033	15.5421	15.6544	15.6544	15.6905	15.6905	15.7258	15.7258	15.6177	15.6177	15.5802
alpha	2.0255	2.0336	2.0361	2.0436	2.0436	2.0460	2.0460	2.0484	2.0484	2.0412	2.0412	2.0387
util living area	0.8868	0.8707	0.8335	0.7658	0.6607	0.5004	0.3772	0.3793	0.5829	0.7553	0.8495	0.8928 (86)
MIT	18.5245	18.7148	19.1692	19.7694	20.3454	20.7564	20.9083	20.9105	20.6474	20.0443	19.2504	18.5238 (87)
Th 2	19.9190	19.9265	19.9288	19.9357	19.9357	19.9379	19.9379	19.9400	19.9400	19.9335	19.9335	19.9312 (88)
util rest of house	0.8736	0.8557	0.8133	0.7353	0.6107	0.4213	0.2702	0.2684	0.5072	0.7153	0.8289	0.8802 (89)
MIT 2	16.7053	16.9763	17.6191	18.4576	19.2332	19.7366	19.8900	19.8950	19.6248	18.8484	17.7458	16.7096 (90)
Living area fraction												0.1671 (91)
MIT	17.0093	17.2668	17.8781	18.6768	19.4190	19.9070	20.0602	20.0647	19.7957	19.0483	17.9972	17.0127 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.8593	17.1168	17.7281	18.5268	19.2690	19.7570	19.9102	19.9147	19.6457	18.8983	17.8472	16.8627 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8217	0.8028	0.7597	0.6860	0.5745	0.4065	0.2672	0.2656	0.4833	0.6676	0.7753	0.8293 (94)
Useful gains	537.8061	557.3064	560.8563	536.7019	454.3706	327.2734	202.0348	193.0387	331.7364	432.8065	487.4695	517.7672 (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	1101.3676	1078.8698	979.6000	817.2694	598.2988	373.2086	213.8628	204.1631	400.2403	641.4326	879.5004	1078.0203 (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	419.2897	350.4907	311.5453	202.0086	107.0826	0.0000	0.0000	0.0000	0.0000	155.2178	282.2623	416.8283 (98)
Space heating												2244.7253 (98)
Space heating per m2												27.3214 (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													2488.6090 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	419.2897	350.4907	311.5453	202.0086	107.0826	0.0000	0.0000	0.0000	0.0000	155.2178	282.2623	416.8283	(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)	464.8445	388.5706	345.3939	223.9563	118.7169	0.0000	0.0000	0.0000	0.0000	172.0818	312.9293	462.1156	(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	103.8274	90.5589	93.9168	84.0339	81.7445	71.8115	68.7929	77.4572	77.9073	88.7245	94.4372	100.6477	(64)
Efficiency of water heater (217)m	87.0782	86.9743	86.5777	85.6547	83.6583	76.4000	76.4000	76.4000	76.4000	84.6395	86.2924	76.4000	(216)
Fuel for water heating, kWh/month	119.2347	104.1214	108.4769	98.1077	97.7123	93.9941	90.0431	101.3838	101.9729	104.8264	109.4385	115.5029	(219)
Water heating fuel used												1244.8148	(219)
Annual totals kWh/year													
Space heating fuel - main system												2488.6090	(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)												388.5754	(232)
Total delivered energy for all uses												4196.9992	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2488.6090	7.6100	189.3831 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1244.8148	7.6100	94.7304 (247)
Pumps and fans for heating	75.0000	31.0800	23.3100 (249)
Energy for lighting	388.5754	31.0800	120.7692 (250)
Additional standing charges			105.0000 (251)
Total energy cost			533.1928 (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	2488.6090	0.2160	537.5395 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1244.8148	0.2160	268.8800 (264)
Space and water heating			806.4195 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	388.5754	0.5190	201.6706 (268)
Total kg/year			1047.0152 (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	2488.6090	1.2200	3036.1030 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1244.8148	1.2200	1518.6740 (264)
Space and water heating			4554.7770 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	388.5754	3.0700	1192.9265 (268)
Primary energy kWh/year			5977.9536 (272)
Primary energy kWh/m2/year			72.7599 (273)

SAP 2012 EPC IMPROVEMENTS

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

(For testing purposes):

A	Not considered
B	Not considered
C	Not considered
D	Not considered
E	Low energy lighting
F	Already installed
G	Not considered
H	Not considered
I	Not considered
J	Not considered
K	Not considered
M	Not considered
N	Solar water heating
O	SAP increase too small
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U	Solar photovoltaic panels
A2	Recommended
A3	Not considered
T2	Not considered
W	Not considered
X	Not considered
Y	Not considered
J2	Not considered
Q2	Not considered
Z1	Not considered
Z2	Not considered
Z3	Not considered
Z4	Not considered
Z5	Not considered
V2	Wind turbine
L2	Not applicable
Q3	Not considered
O3	Not considered

Recommended measures:	SAP change	Cost change	CO2 change
U Solar photovoltaic panels	+ 10.5	-£ 605	-1010 kg (96.5%)

Measures omitted - SAP change or cost saving too small:

N Solar water heating	+ 0.9	-£ 44	-143 kg (13.7%)
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Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar photovoltaic panels	£605 12.30 kg/m²	A 95	A 97
Total Savings	£605 12.30 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 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	£144	£144	£0
Mains gas	£389	£389	£0
Space heating	£318	£318	£0
Water heating	£95	£95	£0
Lighting	£121	£121	£0
Generated (PV)	-£0	-£605	£605
Total cost of fuels	£533	-£72	£605
Total cost of uses	£534	-£71	£605
Delivered energy	51 kWh/m²	27 kWh/m²	24 kWh/m²
Carbon dioxide emissions	1.0 tonnes	0.0 tonnes	1.0 tonnes
CO2 emissions per m²	13 kg/m²	0 kg/m²	12 kg/m²
Primary energy	73 kWh/m²	0 kWh/m²	73 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	41.0800 (1b)	x 2.3700 (2b)	= 97.3596 (1b) - (3b)
First floor	41.0800 (1c)	x 2.6200 (2c)	= 107.6296 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	82.1600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 204.9892 (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) = 0.1463 (8)
Pressure test					Yes
Measured/design AP50					4.7800
Infiltration rate					0.3853 (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) =	0.3564 (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	0.4545	0.4456	0.4366	0.3921	0.3832	0.3386	0.3386	0.3297	0.3564	0.3832	0.4010	0.4188 (22b)
Effective ac	0.6033	0.5993	0.5953	0.5769	0.5734	0.5573	0.5573	0.5544	0.5635	0.5734	0.5804	0.5877 (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)			9.8900	1.3258	13.1117		(27)
Flr - Ground			41.0820	0.1800	7.3948	75.6000	3105.7992 (28a)
Wl - Brick (Timber Frame)	90.5550	11.9790	78.5760	0.2100	16.5010	7.4000	581.4624 (29a)
Rf - Ins Joist	41.0820		41.0820	0.0800	3.2866	7.4000	304.0068 (30)
Total net area of external elements Aum(A, m ²)			172.7200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	42.8020		(33)
Party Wall			46.2060	0.0000	0.0000	7.4000	341.9244 (32)
Stud			70.8677			7.4000	524.4213 (32c)
Internal Floor			41.0820			7.4000	304.0068 (32d)
Internal Ceiling			41.0820			7.4000	304.0068 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 5465.6277 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							66.5242 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.6210 (36)
Total fabric heat loss							(33) + (36) = 58.4230 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	40.8092	40.5379	40.2720	39.0231	38.7894	37.7016	37.7016	37.5002	38.1206	38.7894	39.2621	39.7563 (38)
Heat transfer coeff	99.2322	98.9610	98.6950	97.4461	97.2124	96.1247	96.1247	95.9232	96.5437	97.2124	97.6852	98.1794 (39)
Average = Sum(39)m / 12 =												97.4450 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2078	1.2045	1.2013	1.1861	1.1832	1.1700	1.1700	1.1675	1.1751	1.1832	1.1890	1.1950 (40)
HLP (average)												1.1860 (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												2.5026 (42)
Average daily hot water use (litres/day)												93.6360 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	102.9996	99.2542	95.5087	91.7633	88.0178	84.2724	84.2724	88.0178	91.7633	95.5087	99.2542	102.9996 (44)
Energy content (annual)	152.7454	133.5921	137.8551	120.1854	115.3208	99.5131	92.2135	105.8163	107.0801	124.7915	136.2197	147.9258 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1473.2589 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

	22.9118	20.0388	20.6783	18.0278	17.2981	14.9270	13.8320	15.8724	16.0620	18.7187	20.4330	22.1889 (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	0.5967	0.5925	0.4963	0.4568	0.3774	0.3497	0.4191	0.4422	0.5363	0.6084	0.6491 (61)
Total heat required for water heating calculated for each month	153.4157	134.1888	138.4476	120.6817	115.7775	99.8904	92.5632	106.2354	107.5223	125.3279	136.8281	148.5749 (62)
WWHRS	-49.5882	-43.6299	-44.5308	-36.6478	-34.0330	-28.0789	-23.7702	-28.7782	-29.6150	-36.6034	-42.3910	-47.9272 eq. (G10)
Total of WWHRS savings												-445.5938
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	103.8274	90.5589	93.9168	84.0339	81.7445	71.8115	68.7929	77.4572	77.9073	88.7245	94.4372	100.6477 (64)
Heat gains from water heating, kWh/month	50.9554	44.5686	45.9849	40.0857	38.4583	33.1824	30.7484	35.2887	35.7147	41.6273	45.4452	49.3476 (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	150.1541	150.1541	150.1541	150.1541	150.1541	150.1541	150.1541	150.1541	150.1541	150.1541	150.1541	150.1541 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.0069	48.8566	39.7329	30.0803	22.4854	18.9831	20.5119	26.6622	35.7859	45.4385	53.0334	56.5357 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	334.1725	337.6402	328.9018	310.2988	286.8158	264.7451	250.0005	246.5328	255.2712	273.8743	297.3573	319.4279 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.5180	52.5180	52.5180	52.5180	52.5180	52.5180	52.5180	52.5180	52.5180	52.5180	52.5180	52.5180 (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)	-100.1027	-100.1027	-100.1027	-100.1027	-100.1027	-100.1027	-100.1027	-100.1027	-100.1027	-100.1027	-100.1027	-100.1027 (71)
Water heating gains (Table 5)	68.4885	66.3223	61.8077	55.6746	51.6913	46.0867	41.3285	47.4311	49.6037	55.9506	63.1183	66.3274 (72)
Total internal gains	563.2372	558.3884	536.0117	501.6231	466.5619	435.3843	417.4103	426.1954	446.2302	480.8327	519.0783	547.8604 (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		
North				7.1650	10.6334	0.7300	0.7200	0.7700		27.7509 (74)		
South				2.7240	46.7521	0.7300	0.7200	0.7700		46.3870 (78)		

Solar gains	74.1379	129.0033	186.8889	254.1241	308.9661	318.4293	302.0584	258.6957	209.4394	145.0700	89.2187	63.2172 (83)
Total gains	637.3751	687.3917	722.9006	755.7471	775.5280	753.8136	719.4687	684.8912	655.6697	625.9027	608.2970	611.0775 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	15.2998	15.3417	15.3830	15.5802	15.6177	15.7944	15.7944	15.8276	15.7258	15.6177	15.5421	15.4638
alpha	2.0200	2.0228	2.0255	2.0387	2.0412	2.0530	2.0530	2.0552	2.0484	2.0412	2.0361	2.0309
util living area	0.9054	0.8873	0.8579	0.8044	0.7211	0.6022	0.4864	0.5186	0.6773	0.8135	0.8821	0.9119 (86)
MIT	18.1319	18.3851	18.8407	19.4689	20.0744	20.5647	20.8030	20.7675	20.4018	19.6531	18.8014	18.0836 (87)
Th 2	19.9138	19.9164	19.9190	19.9312	19.9335	19.9441	19.9441	19.9461	19.9400	19.9335	19.9288	19.9240 (88)
util rest of house	0.8950	0.8748	0.8414	0.7797	0.6817	0.5383	0.3951	0.4294	0.6201	0.7852	0.8671	0.9021 (89)
MIT 2	16.1423	16.5027	17.1512	18.0403	18.8742	19.5206	19.7982	19.7651	19.3246	18.3122	17.1073	16.0766 (90)
Living area fraction	16.4748	16.8173	17.4335	18.2790	19.0748	19.6951	19.9661	19.9326	19.5047	18.5363	17.3904	16.4120 (91)
MIT	16.4748	16.8173	17.4335	18.2790	19.0748	19.6951	19.9661	19.9326	19.5047	18.5363	17.3904	16.4120 (92)
Temperature adjustment	16.3248	16.6673	17.2835	18.1290	18.9248	19.5451	19.8161	19.7826	19.3547	18.3863	17.2404	16.2620 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	538.8910	565.7002	569.3142	549.5934	494.3200	385.1299	275.4621	283.5173	382.2021	458.4679	495.6990	521.9214 (94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1193.2461	1164.5015	1064.2826	899.3309	702.3384	475.3471	309.1453	324.4739	507.3041	756.9218	990.5694	1184.2404 (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	486.8402	402.3944	368.2565	251.8110	154.7657	0.0000	0.0000	0.0000	0.0000	222.0497	356.3067	492.7653 (98)
Space heating												2735.1897 (98)
Space heating per m2												(98) / (4) = 33.2910 (99)

8c. Space cooling requirement

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													3032.3610 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	486.8402	402.3944	368.2565	251.8110	154.7657	0.0000	0.0000	0.0000	0.0000	222.0497	356.3067	492.7653	(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)	539.7342	446.1136	408.2667	279.1696	171.5806	0.0000	0.0000	0.0000	0.0000	246.1749	395.0185	546.3030	(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	103.8274	90.5589	93.9168	84.0339	81.7445	71.8115	68.7929	77.4572	77.9073	88.7245	94.4372	100.6477	(64)
Efficiency of water heater (217)m	87.4242	87.3031	87.0064	86.2996	84.8997	76.4000	76.4000	76.4000	76.4000	85.7766	86.9109	76.4000	(216)
Fuel for water heating, kWh/month	118.7628	103.7293	107.9424	97.3746	96.2836	93.9941	90.0431	101.3838	101.9729	103.4367	108.6597	115.0012	(219)
Water heating fuel used												1238.5843	(219)
Annual totals kWh/year													
Space heating fuel - main system												3032.3610	(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)												388.5754	(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												3007.2814	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3032.3610	3.4800	105.5262 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1238.5843	3.4800	43.1027 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	388.5754	13.1900	51.2531 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-1727.2394	13.1900	-227.8229 (252)
Total energy cost			101.9516 (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] =	0.3367 (257)
SAP value		95.3025
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	3032.3610	0.2160	654.9900 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1238.5843	0.2160	267.5342 (264)
Space and water heating			922.5242 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	388.5754	0.5190	201.6706 (268)
Energy saving/generation technologies			
PV Unit	-1727.2394	0.5190	-896.4372 (269)
Total kg/year			266.6826 (272)
CO2 emissions per m2			3.2500 (273)
EI value			97.1897
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	41.0800 (1b)	x 2.3700 (2b)	= 97.3596 (1b) - (3b)
First floor	41.0800 (1c)	x 2.6200 (2c)	= 107.6296 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	82.1600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 204.9892 (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) = 0.1463 (8)
Pressure test					Yes
Measured/design AP50					4.7800
Infiltration rate					0.3853 (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) =	0.3564 (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	0.4366	0.4099	0.4010	0.3743	0.3743	0.3654	0.3654	0.3564	0.3564	0.3832	0.3832	0.3921 (22b)
Effective ac	0.5953	0.5840	0.5804	0.5700	0.5700	0.5667	0.5667	0.5635	0.5635	0.5734	0.5734	0.5769 (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)			9.8900	1.3258	13.1117		(27)
Flr - Ground			41.0820	0.1800	7.3948	75.6000	3105.7992 (28a)
Wl - Brick (Timber Frame)	90.5550	11.9790	78.5760	0.2100	16.5010	7.4000	581.4624 (29a)
Rf - Ins Joist	41.0820		41.0820	0.0800	3.2866	7.4000	304.0068 (30)
Total net area of external elements Aum(A, m ²)			172.7200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	42.8020		(33)
Party Wall			46.2060	0.0000	0.0000	7.4000	341.9244 (32)
Stud			70.8677			7.4000	524.4213 (32c)
Internal Floor			41.0820			7.4000	304.0068 (32d)
Internal Ceiling			41.0820			7.4000	304.0068 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 5465.6277 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							66.5242 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.6210 (36)
Total fabric heat loss							(33) + (36) = 58.4230 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	40.2720	39.5065	39.2621	38.5611	38.5611	38.3382	38.3382	38.1206	38.1206	38.7894	38.7894	39.0231 (38)
Heat transfer coeff	98.6950	97.9296	97.6852	96.9841	96.9841	96.7612	96.7612	96.5437	96.5437	97.2124	97.2124	97.4461 (39)
Average = Sum(39)m / 12 =												97.2299 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2013	1.1919	1.1890	1.1804	1.1804	1.1777	1.1777	1.1751	1.1751	1.1832	1.1832	1.1861 (40)
HLP (average)												1.1834 (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												2.5026 (42)
Average daily hot water use (litres/day)												93.6360 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	102.9996	99.2542	95.5087	91.7633	88.0178	84.2724	84.2724	88.0178	91.7633	95.5087	99.2542	102.9996 (44)
Energy conte	152.7454	133.5921	137.8551	120.1854	115.3208	99.5131	92.2135	105.8163	107.0801	124.7915	136.2197	147.9258 (45)
Energy content (annual)												Total = Sum(45)m = 1473.2589 (45)
Distribution loss (46)m = 0.15 x (45)m												

	22.9118	20.0388	20.6783	18.0278	17.2981	14.9270	13.8320	15.8724	16.0620	18.7187	20.4330	22.1889 (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	0.5967	0.5925	0.4963	0.4568	0.3774	0.3497	0.4191	0.4422	0.5363	0.6084	0.6491 (61)
Total heat required for water heating calculated for each month												
WWHRS	153.4157	134.1888	138.4476	120.6817	115.7775	99.8904	92.5632	106.2354	107.5223	125.3279	136.8281	148.5749 (62)
Total of WWHRS savings	-49.5882	-43.6299	-44.5308	-36.6478	-34.0330	-28.0789	-23.7702	-28.7782	-29.6150	-36.6034	-42.3910	-47.9272 eq. (G10)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-445.5938
Output from w/h								Solar input (sum of months) =	Sum(63)m =			0.0000 (63)
	103.8274	90.5589	93.9168	84.0339	81.7445	71.8115	68.7929	77.4572	77.9073	88.7245	94.4372	100.6477 (64)
								Total per year (kWh/year) =	Sum(64)m =			1033.8598 (64)
Heat gains from water heating, kWh/month												
	50.9554	44.5686	45.9849	40.0857	38.4583	33.1824	30.7484	35.2887	35.7147	41.6273	45.4452	49.3476 (65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	150.1541	150.1541	150.1541	150.1541	150.1541	150.1541	150.1541	150.1541	150.1541	150.1541	150.1541	150.1541 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.0069	48.8566	39.7329	30.0803	22.4854	18.9831	20.5119	26.6622	35.7859	45.4385	53.0334	56.5357 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	334.1725	337.6402	328.9018	310.2988	286.8158	264.7451	250.0005	246.5328	255.2712	273.8743	297.3573	319.4279 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.5180	52.5180	52.5180	52.5180	52.5180	52.5180	52.5180	52.5180	52.5180	52.5180	52.5180	52.5180 (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)	-100.1027	-100.1027	-100.1027	-100.1027	-100.1027	-100.1027	-100.1027	-100.1027	-100.1027	-100.1027	-100.1027	-100.1027 (71)
Water heating gains (Table 5)	68.4885	66.3223	61.8077	55.6746	51.6913	46.0867	41.3285	47.4311	49.6037	55.9506	63.1183	66.3274 (72)
Total internal gains	563.2372	558.3884	536.0117	501.6231	466.5619	435.3843	417.4103	426.1954	446.2302	480.8327	519.0783	547.8604 (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			
North				7.1650	13.4684	0.7300		0.7200	0.7700		35.1497 (74)	
South				2.7240	56.5862	0.7300		0.7200	0.7700		56.1444 (78)	
Solar gains	91.2941	135.8476	202.2906	280.7799	324.2827	369.7974	338.7653	300.6764	240.1646	167.4725	109.6328	76.4518 (83)
Total gains	654.5313	694.2360	738.3024	782.4030	790.8445	805.1817	756.1756	726.8718	686.3949	648.3052	628.7110	624.3122 (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	15.3830	15.5033	15.5421	15.6544	15.6544	15.6905	15.6905	15.7258	15.7258	15.6177	15.6177	15.5802
alpha	2.0255	2.0336	2.0361	2.0436	2.0436	2.0460	2.0460	2.0484	2.0484	2.0412	2.0412	2.0387
util living area	0.8868	0.8707	0.8335	0.7658	0.6607	0.5004	0.3772	0.3793	0.5829	0.7553	0.8495	0.8928 (86)
MIT	18.5245	18.7148	19.1692	19.7694	20.3454	20.7564	20.9083	20.9105	20.6474	20.0443	19.2504	18.5238 (87)
Th 2	19.9190	19.9265	19.9288	19.9357	19.9357	19.9379	19.9379	19.9400	19.9400	19.9335	19.9335	19.9312 (88)
util rest of house	0.8736	0.8557	0.8133	0.7353	0.6107	0.4213	0.2702	0.2684	0.5072	0.7153	0.8289	0.8802 (89)
MIT 2	16.7053	16.9763	17.6191	18.4576	19.2332	19.7366	19.8900	19.8950	19.6248	18.8484	17.7458	16.7096 (90)
Living area fraction												0.1671 (91)
MIT	17.0093	17.2668	17.8781	18.6768	19.4190	19.9070	20.0602	20.0647	19.7957	19.0483	17.9972	17.0127 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.8593	17.1168	17.7281	18.5268	19.2690	19.7570	19.9102	19.9147	19.6457	18.8983	17.8472	16.8627 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8217	0.8028	0.7597	0.6860	0.5745	0.4065	0.2672	0.2656	0.4833	0.6676	0.7753	0.8293 (94)
Useful gains	537.8061	557.3064	560.8563	536.7019	454.3706	327.2734	202.0348	193.0387	331.7364	432.8065	487.4695	517.7672 (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	1101.3676	1078.8698	979.6000	817.2694	598.2988	373.2086	213.8628	204.1631	400.2403	641.4326	879.5004	1078.0203 (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	419.2897	350.4907	311.5453	202.0086	107.0826	0.0000	0.0000	0.0000	0.0000	155.2178	282.2623	416.8283 (98)
Space heating												2244.7253 (98)
Space heating per m2												27.3214 (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												2488.6090	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	419.2897	350.4907	311.5453	202.0086	107.0826	0.0000	0.0000	0.0000	0.0000	155.2178	282.2623	416.8283	(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)	464.8445	388.5706	345.3939	223.9563	118.7169	0.0000	0.0000	0.0000	0.0000	172.0818	312.9293	462.1156	(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	103.8274	90.5589	93.9168	84.0339	81.7445	71.8115	68.7929	77.4572	77.9073	88.7245	94.4372	100.6477	(64)
Efficiency of water heater													
(217)m	87.0782	86.9743	86.5777	85.6547	83.6583	76.4000	76.4000	76.4000	76.4000	84.6395	86.2924	76.4000	(216)
Fuel for water heating, kWh/month													
	119.2347	104.1214	108.4769	98.1077	97.7123	93.9941	90.0431	101.3838	101.9729	104.8264	109.4385	115.5029	(219)
Water heating fuel used												1244.8148	(219)
Annual totals kWh/year													
Space heating fuel - main system												2488.6090	(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)												388.5754	(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												2250.5533	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2488.6090	7.6100	189.3831 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1244.8148	7.6100	94.7304 (247)
Pumps and fans for heating	75.0000	31.0800	23.3100 (249)
Energy for lighting	388.5754	31.0800	120.7692 (250)
Additional standing charges			105.0000 (251)
Energy saving/generation technologies			
PV Unit	-1946.4459	31.0800	-604.9554 (252)
Total energy cost			-71.7626 (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	2488.6090	0.2160	537.5395 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1244.8148	0.2160	268.8800 (264)
Space and water heating			806.4195 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	388.5754	0.5190	201.6706 (268)
Energy saving/generation technologies			
PV Unit	-1946.4459	0.5190	-1010.2054 (269)
Total kg/year			36.8097 (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	2488.6090	1.2200	3036.1030 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1244.8148	1.2200	1518.6740 (264)
Space and water heating			4554.7770 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	388.5754	3.0700	1192.9265 (268)
Energy saving/generation technologies			
PV Unit	-1946.4459	3.0700	-5975.5890 (269)
Primary energy kWh/year			2.3645 (272)
Primary energy kWh/m2/year			0.0288 (273)

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Built)

Property Reference	048 - PRJ013014	Issued on Date	09/05/2024
Assessment Reference	048	Prop Type Ref	2B
Property	1 Rashleigh Drive, Netley Abbey, Southampton, SO31 5JY		
SAP Rating	85 B	DER	15.20
Environmental	88 B	TER	18.54
CO ₂ Emissions (t/year)	1.05	% DER<TER	18.04
General Requirements Compliance	Pass	DFEE	46.12
		TFEE	51.95
		% DFEE<TFEE	11.22
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)	18.54	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	15.20	kgCO ₂ /m ²	Pass
	-3.34 (-18.0%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	51.95	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	46.12	kWh/m ² /yr	
	-5.9 (-11.3%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.21 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.18 (max. 0.25)	0.18 (max. 0.70)	Pass
Roof	0.08 (max. 0.20)	0.08 (max. 0.35)	Pass
Openings	1.37 (max. 2.00)	1.40 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.78 (measured in this dwelling)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Built)

Main heating system

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

Pass

Secondary heating system

None

5 Cylinder insulation

Hot water storage

No cylinder

6 Controls

Space heating controls

Time and temperature zone control

Pass

Hot water controls

No cylinder

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100 %

Minimum

75 %

Pass

8 Mechanical ventilation

Not applicable

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Southern England)

Slight

Pass

Based on:

Overshading

Average

Windows facing North

7.17 m², No overhang

Windows facing South

2.72 m², No overhang

Air change rate

4.66 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

4.78 (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