



elmhurst
energy



SAP Report Submission for Building Regulations Compliance

Client:

Project: Oak View, Brinsea
Congresbury, BRISTOL, BS49 5JP

Contact: Michael Heinemans
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Report Issue Date: 28/09/2021

EXCELLENCE
IN ENERGY
ASSESSMENT

FULL SAP CALCULATION PRINTOUT

Calculation Type: Conversion (As Built)

Property Reference	200046	Issued on Date	28/09/2021
Assessment Reference	001	Prop Type Ref	4 Brinsea Batch BS49 5JP
Property	Oak View, Brinsea, Congresbury, BRISTOL, BS49 5JP		

SAP Rating	65 D	DER	N/A	TER	N/A
Environmental	76 C	% DER<TER	N/A		
CO ₂ Emissions (t/year)	2.78	DFEE	N/A	TTEE	N/A
General Requirements Compliance	N/A	% DFEE<TTEE	N/A		

Assessor Details	Mr. Michael Heinemans, DEA 4 U, Tel: 01275 878257, mhmmmb@yahoo.co.uk	Assessor ID	D395-0001
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CALCULATION OF HEAT DEMAND 09 Jan 2014

SAP 2012 WORKSHEET FOR Conversion (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	68.9800 (1b)	2.4000 (2b)	165.5520 (1b) - (3b)
First floor	68.9800 (1c)	2.9900 (2c)	206.2502 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	137.9600		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 371.8022 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour							
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)							
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)							
Number of intermittent fans				5 * 10 =	50.0000 (7a)							
Number of passive vents				0 * 10 =	0.0000 (7b)							
Number of flueless gas fires				0 * 40 =	0.0000 (7c)							
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				50.0000 / (5) =	0.1345 (8)							
Pressure test				No								
Measured/design AP50				15.0000								
Infiltration rate					0.8845 (18)							
Number of sides sheltered					2 (19)							
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)							
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.7518 (21)							
Wind speed	Jan 4.5000	Feb 4.2000	Mar 4.3000	Apr 4.0000	May 4.1000	Jun 3.7000	Jul 3.9000	Aug 3.6000	Sep 3.6000	Oct 3.9000	Nov 3.9000	Dec 4.2000 (22)
Wind factor	1.1250	1.0500	1.0750	1.0000	1.0250	0.9250	0.9750	0.9000	0.9000	0.9750	0.9750	1.0500 (22a)
Adj infiltr rate	0.8458	0.7894	0.8082	0.7518	0.7706	0.6954	0.7330	0.6766	0.6766	0.7330	0.7330	0.7894 (22b)
Effective ac	0.8577	0.8116	0.8266	0.7826	0.7969	0.7418	0.7687	0.7289	0.7289	0.7687	0.7687	0.8116 (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
Opening Type 1 window (Uw = 1.60)			19.4000	1.5038	29.1729		(27)
Opening Type 3 velux (Uw = 1.30)			2.6900	1.2357	3.3241		(27a)
Heat Loss Floor 1			68.9800	0.1000	6.8980	78.0000	5380.4400 (28a)
External Wall 1 cavity	39.9600	11.8000	28.1600	0.2800	7.8848	41.6000	1171.4560 (29a)
External Wall 2 timber frame	48.1200	7.6000	40.5200	0.1600	6.4832	20.3200	823.3664 (29a)
External Roof 1	45.3400	2.6900	42.6500	0.1500	6.3975	9.0000	383.8500 (30)
External Roof 2	50.2400		50.2400	0.1600	8.0384	15.7000	788.7680 (30)
Total net area of external elements Aum(A, m ²)			252.6400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	68.1990		(33)
Party Wall 1			88.0800	0.0000	0.0000	70.0000	6165.6000 (32)
Internal Wall 1			109.2000			75.0000	8190.0000 (32c)
Internal Wall 2			143.4800			9.0000	1291.3200 (32c)
Internal Floor 1			68.9800			18.0000	1241.6400 (32d)
Internal Ceiling 1			68.9800			9.0000	620.8200 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	26057.2604 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							188.8755 (35)
Thermal bridges (Default value 0.150 * total exposed area)							37.8960 (36)

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CALCULATION OF HEAT DEMAND 09 Jan 2014

Total fabric heat loss												(33) + (36) =	106.0950 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	105.2322	99.5760	101.4181	96.0218	97.7772	91.0157	94.3098	89.4337	89.4337	94.3098	94.3098	99.5760	(38)
Average = Sum(39)m / 12 =	211.3272	205.6709	207.5130	202.1168	203.8722	197.1107	200.4048	195.5287	195.5287	200.4048	200.4048	205.6709	(39)
												202.1295	(39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.5318	1.4908	1.5042	1.4650	1.4778	1.4288	1.4526	1.4173	1.4173	1.4526	1.4526	1.4908	(40)
Days in month												1.4651	(40)
	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9131 (42)	
Average daily hot water use (litres/day)												103.3861 (43)	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	113.7247	109.5893	105.4538	101.3184	97.1829	93.0475	93.0475	97.1829	101.3184	105.4538	109.5893	113.7247	(44)
Energy content (annual)	168.6504	147.5027	152.2096	132.7000	127.3288	109.8751	101.8154	116.8347	118.2301	137.7858	150.4039	163.3289	(45)
Distribution loss (46)m = 0.15 x (45)m	25.2976	22.1254	22.8314	19.9050	19.0993	16.4813	15.2723	17.5252	17.7345	20.6679	22.5606	24.4993	(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													
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Total heat required for water heating calculated for each month	50.9589	46.0274	50.9589	49.3151	49.5234	45.8864	47.4160	49.5234	49.3151	50.9589	49.3151	50.9589	(61)
Solar input	219.6093	193.5301	203.1685	182.0151	176.8522	155.7615	149.2314	166.3581	167.5452	188.7447	199.7190	214.2878	(62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
								Solar input (sum of months) = Sum(63)m =				0.0000	(63)
	219.6093	193.5301	203.1685	182.0151	176.8522	155.7615	149.2314	166.3581	167.5452	188.7447	199.7190	214.2878	(64)
RHI water heating demand												2217 (64)	
Heat gains from water heating, kWh/month	68.8160	60.5515	63.3494	56.4515	54.7177	48.0051	45.7076	51.2284	51.6403	58.5535	62.3381	67.0466	(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	174.7859	174.7859	174.7859	174.7859	174.7859	174.7859	174.7859	174.7859	174.7859	174.7859	174.7859	174.7859	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.0521	63.1079	51.3228	38.8546	29.0443	24.5204	26.4952	34.4394	46.2245	58.6927	68.5030	73.0269	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	458.3290	463.0850	451.1000	425.5853	393.3776	363.1069	342.8842	338.1282	350.1132	375.6279	407.8356	438.1063	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.3917	55.3917	55.3917	55.3917	55.3917	55.3917	55.3917	55.3917	55.3917	55.3917	55.3917	55.3917	(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)	-116.5239	-116.5239	-116.5239	-116.5239	-116.5239	-116.5239	-116.5239	-116.5239	-116.5239	-116.5239	-116.5239	-116.5239	(71)
Water heating gains (Table 5)	92.4946	90.1064	85.1471	78.4049	73.5453	66.6737	61.4350	68.8553	71.7226	78.7009	86.5807	90.1164	(72)
Total internal gains	738.5294	732.9530	704.2235	659.4985	612.6208	570.9547	547.4680	558.0766	584.7140	629.6752	679.5729	717.9033	(73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains							
	m ²	Table 6a	Specific data	Specific data	factor	W							
		W/m ²	or Table 6b	or Table 6c	Table 6d								
Northeast	12.8000	14.2063	0.7600	0.7000	0.7700	67.0401 (75)							
Southeast	6.6000	44.2931	0.7600	0.7000	0.7700	107.7768 (77)							
Northeast	2.6900	33.0000	0.7600	0.7000	1.0000	42.5031 (82)							
Solar gains	217.3200	358.4758	573.6331	874.4812	1041.2869	1174.6762	1069.8533	916.8323	704.7711	435.3252	261.9297	176.7593	(83)
Total gains	955.8494	1091.4287	1277.8566	1533.9797	1653.9077	1745.6309	1617.3214	1474.9090	1289.4851	1065.0004	941.5027	894.6626	(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	34.2508	35.1928	34.8804	35.8116	35.5033	36.7211	36.1175	37.0182	37.0182	36.1175	36.1175	35.1928	
alpha	3.2834	3.3462	3.3254	3.3874	3.3669	3.4481	3.4078	3.4679	3.4679	3.4078	3.4078	3.3462	
util living area	0.9875	0.9798	0.9578	0.8946	0.7797	0.5611	0.4510	0.4685	0.7382	0.9305	0.9780	0.9897	(86)
MIT	20.3009	20.3634	20.4527	20.5856	20.6807	20.7484	20.7562	20.7601	20.7226	20.5902	20.4457	20.3072	(87)
Th 2	19.6637	19.6944	19.6844	19.7138	19.7042	19.7414	19.7232	19.7501	19.7501	19.7232	19.7232	19.6944	(88)

FULL SAP CALCULATION PRINTOUT

Calculation Type: Conversion (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

util rest of house	0.9838	0.9739	0.9449	0.8626	0.7115	0.4489	0.3085	0.3203	0.6363	0.9009	0.9702	0.9867 (89)
MIT 2	19.0188	19.1092	19.1872	19.3409	19.4146	19.5001	19.4845	19.5154	19.4952	19.3577	19.2180	19.0537 (90)
Living area fraction									fLA = Living area / (4) =			0.1469 (91)
MIT	19.2072	19.2934	19.3731	19.5238	19.6006	19.6835	19.6713	19.6983	19.6755	19.5388	19.3984	19.2379 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2072	19.2934	19.3731	19.5238	19.6006	19.6835	19.6713	19.6983	19.6755	19.5388	19.3984	19.2379 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9823	0.9717	0.9412	0.8570	0.7052	0.4433	0.3024	0.3138	0.6292	0.8955	0.9677	0.9853 (94)
Useful gains	938.8958	1060.5030	1202.6643	1314.5686	1166.2602	773.8578	489.1404	462.8809	811.3592	953.7396	911.0735	881.5389 (95)
Ext temp.	5.5000	6.0000	7.6000	9.8000	12.7000	15.6000	17.2000	17.3000	15.0000	11.7000	8.4000	5.5000 (96)
Heat loss rate W	2896.6943	2734.0754	2443.0751	1965.3463	1406.8421	804.9106	495.2629	468.9304	914.1934	1570.9359	2204.1368	2825.4851 (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	1456.6021	1124.6407	922.8656	468.5600	178.9929	0.0000	0.0000	0.0000	0.0000	459.1941	931.0056	1446.2959 (98)
Space heating												6988.1569 (98)
RHI space heating demand												6988 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: Conversion (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

SAP 2012 WORKSHEET FOR Conversion (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	68.9800 (1b)	x 2.4000 (2b)	= 165.5520 (1b) - (3b)
First floor	68.9800 (1c)	x 2.9900 (2c)	= 206.2502 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	137.9600		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 371.8022 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour							
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)							
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)							
Number of intermittent fans					5 * 10 = 50.0000 (7a)							
Number of passive vents					0 * 10 = 0.0000 (7b)							
Number of flueless gas fires					0 * 40 = 0.0000 (7c)							
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					50.0000 / (5) = 0.1345 (8)							
Pressure test					No							
Measured/design AP50					15.0000							
Infiltration rate					0.8845 (18)							
Number of sides sheltered					2 (19)							
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)							
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.7518 (21)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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	0.9586	0.9398	0.9210	0.8270	0.8082	0.7142	0.7142	0.6954	0.7518	0.8082	0.8458	0.8834 (22b)
Effective ac	0.9594	0.9416	0.9241	0.8420	0.8266	0.7551	0.7551	0.7418	0.7826	0.8266	0.8577	0.8902 (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					
Opening Type 1 window (Uw = 1.60)			19.4000	1.5038	29.1729		(27)					
Opening Type 3 velux (Uw = 1.30)			2.6900	1.2357	3.3241		(27a)					
Heat Loss Floor 1			68.9800	0.1000	6.8980	78.0000	5380.4400 (28a)					
External Wall 1 cavity	39.9600	11.8000	28.1600	0.2800	7.8848	41.6000	1171.4560 (29a)					
External Wall 2 timber frame	48.1200	7.6000	40.5200	0.1600	6.4832	20.3200	823.3664 (29a)					
External Roof 1	45.3400	2.6900	42.6500	0.1500	6.3975	9.0000	383.8500 (30)					
External Roof 2	50.2400		50.2400	0.1600	8.0384	15.7000	788.7680 (30)					
Total net area of external elements Aum(A, m ²)			252.6400				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	68.1990		(33)					
Party Wall 1			88.0800	0.0000	0.0000	70.0000	6165.6000 (32)					
Internal Wall 1			109.2000			75.0000	8190.0000 (32c)					
Internal Wall 2			143.4800			9.0000	1291.3200 (32c)					
Internal Floor 1			68.9800			18.0000	1241.6400 (32d)					
Internal Ceiling 1			68.9800			18.0000	1241.6400 (32e)					
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 26678.0804 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							193.3755 (35)					
Thermal bridges (Default value 0.150 * total exposed area)							37.8960 (36)					
Total fabric heat loss							(33) + (36) = 106.0950 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 117.7151	Feb 115.5262	Mar 113.3807	Apr 103.3035	May 101.4181	Jun 92.6411	Jul 92.6411	Aug 91.0157	Sep 96.0218	Oct 101.4181	Nov 105.2322	Dec 109.2198 (38)
Heat transfer coeff	223.8100	221.6212	219.4757	209.3985	207.5130	198.7361	198.7361	197.1107	202.1168	207.5130	211.3272	215.3148 (39)
Average = Sum(39)m / 12 =												209.3894 (39)
HLP	Jan 1.6223	Feb 1.6064	Mar 1.5909	Apr 1.5178	May 1.5042	Jun 1.4405	Jul 1.4405	Aug 1.4288	Sep 1.4650	Oct 1.5042	Nov 1.5318	Dec 1.5607 (40)
HLP (average)												1.5178 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.9131 (42)
Average daily hot water use (litres/day)												103.3861 (43)
Daily hot water use	113.7247	109.5893	105.4538	101.3184	97.1829	93.0475	93.0475	97.1829	101.3184	105.4538	109.5893	113.7247 (44)

FULL SAP CALCULATION PRINTOUT

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CALCULATION OF ENERGY RATINGS 09 Jan 2014

Energy content (annual)	168.6504	147.5027	152.2096	132.7000	127.3288	109.8751	101.8154	116.8347	118.2301	137.7858	150.4039	163.3289 (45)
Distribution loss (46)m = 0.15 x (45)m	25.2976	22.1254	22.8314	19.9050	19.0993	16.4813	15.2723	17.5252	17.7345	20.6679	22.5606	24.4993 (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	50.9589	46.0274	50.9589	49.3151	49.5234	45.8864	47.4160	49.5234	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	219.6093	193.5301	203.1685	182.0151	176.8522	155.7615	149.2314	166.3581	167.5452	188.7447	199.7190	214.2878 (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	219.6093	193.5301	203.1685	182.0151	176.8522	155.7615	149.2314	166.3581	167.5452	188.7447	199.7190	214.2878 (64)
Heat gains from water heating, kWh/month	68.8160	60.5515	63.3494	56.4515	54.7177	48.0051	45.7076	51.2284	51.6403	58.5535	62.3381	67.0466 (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	174.7859	174.7859	174.7859	174.7859	174.7859	174.7859	174.7859	174.7859	174.7859	174.7859	174.7859	174.7859 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.0521	63.1079	51.3228	38.8546	29.0443	24.5204	26.4952	34.4394	46.2245	58.6927	68.5030	73.0269 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	458.3290	463.0850	451.1000	425.5853	393.3776	363.1069	342.8842	338.1282	350.1132	375.6279	407.8356	438.1063 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.3917	55.3917	55.3917	55.3917	55.3917	55.3917	55.3917	55.3917	55.3917	55.3917	55.3917	55.3917 (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)	-116.5239	-116.5239	-116.5239	-116.5239	-116.5239	-116.5239	-116.5239	-116.5239	-116.5239	-116.5239	-116.5239	-116.5239 (71)
Water heating gains (Table 5)	92.4946	90.1064	85.1471	78.4049	73.5453	66.6737	61.4350	68.8553	71.7226	78.7009	86.5807	90.1164 (72)
Total internal gains	738.5294	732.9530	704.2235	659.4985	612.6208	570.9547	547.4680	558.0766	584.7140	629.6752	679.5729	717.9033 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W					
Northeast	12.8000	11.2829	0.7600	0.7000	0.7700	53.2448 (75)						
Southeast	6.6000	36.7938	0.7600	0.7000	0.7700	89.5290 (77)						
Northeast	2.6900	26.0000	0.7600	0.7000	1.0000	33.4873 (82)						
Solar gains	176.2611	330.4329	527.5726	772.4211	967.9414	1004.6471	950.5092	798.9513	611.9878	386.0029	216.7339	147.1480 (83)
Total gains	914.7905	1063.3858	1231.7961	1431.9197	1580.5623	1575.6018	1497.9773	1357.0279	1196.7018	1015.6780	896.3069	865.0512 (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	33.1110	33.4380	33.7649	35.3898	35.7114	37.2885	37.2885	37.5960	36.6648	35.7114	35.0668	34.4174	
alpha	3.2074	3.2292	3.2510	3.3593	3.3808	3.4859	3.4859	3.5064	3.4443	3.3808	3.3378	3.2945	
util living area	0.9917	0.9858	0.9715	0.9303	0.8419	0.6878	0.5429	0.6038	0.8302	0.9570	0.9867	0.9932 (86)	
MIT	20.2169	20.2754	20.3764	20.5289	20.6455	20.7311	20.7559	20.7520	20.6873	20.5327	20.3653	20.2305 (87)	
Th 2	19.5970	19.6086	19.6200	19.6742	19.6844	19.7324	19.7324	19.7414	19.7138	19.6844	19.6637	19.6423 (88)	
util rest of house	0.9893	0.9817	0.9628	0.9080	0.7896	0.5889	0.4040	0.4647	0.7539	0.9389	0.9822	0.9912 (89)	
MIT 2	18.8725	18.9412	19.0516	19.2501	19.3665	19.4822	19.4968	19.5050	19.4338	19.2660	19.0822	18.9280 (90)	
Living area fraction									fLA = Living area / (4) =			0.1469 (91)	
MIT	19.0700	19.1372	19.2462	19.4380	19.5544	19.6657	19.6818	19.6882	19.6180	19.4522	19.2707	19.1194 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.0700	19.1372	19.2462	19.4380	19.5544	19.6657	19.6818	19.6882	19.6180	19.4522	19.2707	19.1194 (93)	

8. Space heating requirement

Utilisation	0.9882	0.9800	0.9599	0.9032	0.7834	0.5831	0.3980	0.4582	0.7469	0.9348	0.9805	0.9903 (94)
Useful gains	903.9999	1042.1397	1182.3793	1293.2741	1238.2762	918.6592	596.1412	621.8292	893.8709	949.4856	878.8166	856.6335 (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	3305.6717	3155.2728	2797.4842	2206.6452	1629.8927	1006.7424	612.4596	648.1456	1115.2775	1836.9367	2572.0090	3212.3651 (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	1786.8438	1420.0255	1201.6380	657.6272	291.3627	0.0000	0.0000	0.0000	0.0000	660.2636	1219.0986	1752.6643 (98)
Space heating												8989.5236 (98)
Space heating per m2												(98) / (4) = 65.1604 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: Conversion (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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 %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													9933.1753 (211)
Space heating requirement	1786.8438	1420.0255	1201.6380	657.6272	291.3627	0.0000	0.0000	0.0000	0.0000	660.2636	1219.0986	1752.6643	(98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)
Space heating fuel (main heating system)	1974.4130	1569.0889	1327.7768	726.6599	321.9477	0.0000	0.0000	0.0000	0.0000	729.5731	1347.0702	1936.6456	(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	219.6093	193.5301	203.1685	182.0151	176.8522	155.7615	149.2314	166.3581	167.5452	188.7447	199.7190	214.2878	(64)
Efficiency of water heater (217)m	89.2725	89.1567	88.8851	88.1008	86.4004	80.4000	80.4000	80.4000	80.4000	88.0413	88.9275	80.4000	(216)
Fuel for water heating, kWh/month	245.9987	217.0675	228.5742	206.5986	204.6892	193.7333	185.6112	206.9130	208.3895	214.3821	224.5864	240.0227	(219)
Water heating fuel used													2576.5664 (219)
Annual totals kWh/year													
Space heating fuel - main system													9933.1753 (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)													501.9212 (232)
Total delivered energy for all uses													13086.6629 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	9933.1753	7.6000	754.9213 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2576.5664	7.6000	195.8190 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	501.9212	13.1900	66.2034 (250)
Additional standing charges			70.0000 (251)
Total energy cost			1096.8363 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	2.5179 (257)
SAP value		64.8756
SAP rating (Section 12)		65 (258)
SAP band		D

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	9933.1753	0.2410	2393.8952 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2576.5664	0.2410	620.9525 (264)
Space and water heating			3014.8477 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	501.9212	0.5190	260.4971 (268)
Total kg/year			3314.2698 (272)
CO2 emissions per m2			24.0200 (273)
EI value			75.7263
EI rating			76 (274)
EI band			C

Calculation of stars for heating and DHW

Main heating energy efficiency	$7.60 \times (1 + 0.29 \times 0.75) / 0.9050 = 10.224$, stars = 2
Main heating environmental impact	$0.241 \times (1 + 0.29 \times 0.75) / 0.9050 = 0.3242$, stars = 4
Water heating energy efficiency	$7.60 / 0.8581 = 8.857$, stars = 2
Water heating environmental impact	$0.241 / 0.8581 = 0.2809$, stars = 4

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FULL SAP CALCULATION PRINTOUT

Calculation Type: Conversion (As Built)

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

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

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	68.9800 (1b)	x 2.4000 (2b)	= 165.5520 (1b) - (3b)
First floor	68.9800 (1c)	x 2.9900 (2c)	= 206.2502 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	137.9600		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 371.8022 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					5 * 10 = 50.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					50.0000 / (5) = 0.1345 (8)
Pressure test					No
Measured/design AP50					15.0000
Infiltration rate					0.8845 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.7518 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.5000	4.2000	4.3000	4.0000	4.1000	3.7000	3.9000	3.6000	3.6000	3.9000	3.9000	4.2000 (22)
Wind factor	1.1250	1.0500	1.0750	1.0000	1.0250	0.9250	0.9750	0.9000	0.9000	0.9750	0.9750	1.0500 (22a)
Adj infilt rate												
Effective ac	0.8458	0.7894	0.8082	0.7518	0.7706	0.6954	0.7330	0.6766	0.6766	0.7330	0.7330	0.7894 (22b)
	0.8577	0.8116	0.8266	0.7826	0.7969	0.7418	0.7687	0.7289	0.7289	0.7687	0.7687	0.8116 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Opening Type 1 window (Uw = 1.60)			19.4000	1.5038	29.1729		(27)
Opening Type 3 velux (Uw = 1.30)			2.6900	1.2357	3.3241		(27a)
Heat Loss Floor 1			68.9800	0.1000	6.8980	78.0000	5380.4400 (28a)
External Wall 1 cavity	39.9600	11.8000	28.1600	0.2800	7.8848	41.6000	1171.4560 (29a)
External Wall 2 timber frame	48.1200	7.6000	40.5200	0.1600	6.4832	20.3200	823.3664 (29a)
External Roof 1	45.3400	2.6900	42.6500	0.1500	6.3975	9.0000	383.8500 (30)
External Roof 2	50.2400		50.2400	0.1600	8.0384	15.7000	788.7680 (30)
Total net area of external elements Aum(A, m2)			252.6400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	68.1990		(33)
Party Wall 1			88.0800	0.0000	0.0000	70.0000	6165.6000 (32)
Internal Wall 1			109.2000			75.0000	8190.0000 (32c)
Internal Wall 2			143.4800			9.0000	1291.3200 (32c)
Internal Floor 1			68.9800			18.0000	1241.6400 (32d)
Internal Ceiling 1			68.9800			18.0000	1241.6400 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	26678.0804 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							193.3755 (35)
Thermal bridges (Default value 0.150 * total exposed area)							37.8960 (36)
Total fabric heat loss						(33) + (36) =	106.0950 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	105.2322	99.5760	101.4181	96.0218	97.7772	91.0157	94.3098	89.4337	89.4337	94.3098	94.3098	99.5760 (38)
Heat transfer coeff	211.3272	205.6709	207.5130	202.1168	203.8722	197.1107	200.4048	195.5287	195.5287	200.4048	200.4048	205.6709 (39)
Average = Sum(39)m / 12 =												202.1295 (39)
HLP	1.5318	1.4908	1.5042	1.4650	1.4778	1.4288	1.4526	1.4173	1.4173	1.4526	1.4526	1.4908 (40)
HLP (average)												1.4651 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.9131 (42)
Average daily hot water use (litres/day)												103.3861 (43)
Daily hot water use	113.7247	109.5893	105.4538	101.3184	97.1829	93.0475	93.0475	97.1829	101.3184	105.4538	109.5893	113.7247 (44)

FULL SAP CALCULATION PRINTOUT

Calculation Type: Conversion (As Built)

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

Energy conte	168.6504	147.5027	152.2096	132.7000	127.3288	109.8751	101.8154	116.8347	118.2301	137.7858	150.4039	163.3289 (45)
Energy content (annual)												Total = Sum(45)m = 1626.6657 (45)
Distribution loss (46)m = 0.15 x (45)m	25.2976	22.1254	22.8314	19.9050	19.0993	16.4813	15.2723	17.5252	17.7345	20.6679	22.5606	24.4993 (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	50.9589	46.0274	50.9589	49.3151	49.5234	45.8864	47.4160	49.5234	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	219.6093	193.5301	203.1685	182.0151	176.8522	155.7615	149.2314	166.3581	167.5452	188.7447	199.7190	214.2878 (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	219.6093	193.5301	203.1685	182.0151	176.8522	155.7615	149.2314	166.3581	167.5452	188.7447	199.7190	214.2878 (64)
Heat gains from water heating, kWh/month	68.8160	60.5515	63.3494	56.4515	54.7177	48.0051	45.7076	51.2284	51.6403	58.5535	62.3381	67.0466 (65)
Total per year (kWh/year) = Sum(64)m = 2216.8230 (64)												

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	174.7859	174.7859	174.7859	174.7859	174.7859	174.7859	174.7859	174.7859	174.7859	174.7859	174.7859	174.7859 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.0521	63.1079	51.3228	38.8546	29.0443	24.5204	26.4952	34.4394	46.2245	58.6927	68.5030	73.0269 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	458.3290	463.0850	451.1000	425.5853	393.3776	363.1069	342.8842	338.1282	350.1132	375.6279	407.8356	438.1063 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.3917	55.3917	55.3917	55.3917	55.3917	55.3917	55.3917	55.3917	55.3917	55.3917	55.3917	55.3917 (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)	-116.5239	-116.5239	-116.5239	-116.5239	-116.5239	-116.5239	-116.5239	-116.5239	-116.5239	-116.5239	-116.5239	-116.5239 (71)
Water heating gains (Table 5)	92.4946	90.1064	85.1471	78.4049	73.5453	66.6737	61.4350	68.8553	71.7226	78.7009	86.5807	90.1164 (72)
Total internal gains	738.5294	732.9530	704.2235	659.4985	612.6208	570.9547	547.4680	558.0766	584.7140	629.6752	679.5729	717.9033 (73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W						
Northeast	12.8000	14.2063	0.7600	0.7000	0.7700	67.0401 (75)						
Southeast	6.6000	44.2931	0.7600	0.7000	0.7700	107.7768 (77)						
Northeast	2.6900	33.0000	0.7600	0.7000	1.0000	42.5031 (82)						
Solar gains	217.3200	358.4758	573.6331	874.4812	1041.2869	1174.6762	1069.8533	916.8323	704.7711	435.3252	261.9297	176.7593 (83)
Total gains	955.8494	1091.4287	1277.8566	1533.9797	1653.9077	1745.6309	1617.3214	1474.9090	1289.4851	1065.0004	941.5027	894.6626 (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	35.0668	36.0312	35.7114	36.6648	36.3491	37.5960	36.9781	37.9002	37.9002	36.9781	36.9781	36.0312
alpha	3.3378	3.4021	3.3808	3.4443	3.4233	3.5064	3.4652	3.5267	3.5267	3.4652	3.4652	3.4021
util living area	0.9883	0.9810	0.9597	0.8974	0.7827	0.5627	0.4519	0.4694	0.7409	0.9328	0.9792	0.9904 (86)
MIT	20.3122	20.3739	20.4619	20.5931	20.6868	20.7531	20.7604	20.7643	20.7278	20.5973	20.4550	20.3185 (87)
Th 2	19.6637	19.6944	19.6844	19.7138	19.7042	19.7414	19.7232	19.7501	19.7501	19.7232	19.7232	19.6944 (88)
util rest of house	0.9848	0.9753	0.9470	0.8656	0.7141	0.4497	0.3088	0.3206	0.6384	0.9037	0.9717	0.9875 (89)
MIT 2	19.0293	19.1189	19.1957	19.3479	19.4201	19.5044	19.4884	19.5193	19.4999	19.3642	19.2265	19.0642 (90)
Living area fraction												fLA = Living area / (4) = 0.1469 (91)
MIT	19.2178	19.3033	19.3817	19.5308	19.6062	19.6878	19.6753	19.7022	19.6803	19.5454	19.4070	19.2485 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2178	19.3033	19.3817	19.5308	19.6062	19.6878	19.6753	19.7022	19.6803	19.5454	19.4070	19.2485 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9833	0.9732	0.9435	0.8602	0.7081	0.4445	0.3032	0.3146	0.6317	0.8985	0.9693	0.9863 (94)
Useful gains	939.9319	1062.1391	1205.6162	1319.4944	1171.1093	775.9983	490.3087	464.0140	814.5632	956.9291	912.6197	882.3893 (95)
Ext temp.	5.5000	6.0000	7.6000	9.8000	12.7000	15.6000	17.2000	17.3000	15.0000	11.7000	8.4000	5.5000 (96)
Heat loss rate W	2898.9360	2736.0980	2444.8642	1966.7649	1407.9846	805.7551	496.0648	469.7054	915.1268	1572.2587	2205.8581	2827.6636 (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	1457.4991	1124.9004	922.0005	466.0348	176.2352	0.0000	0.0000	0.0000	0.0000	457.8052	931.1317	1447.2840 (98)
Space heating												6982.8909 (98)
Space heating per m ²												(98) / (4) = 50.6153 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: Conversion (As Built)

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

8c. Space cooling requirement

Not applicable

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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 %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													7715.9015 (211)
Space heating requirement	1457.4991	1124.9004	922.0005	466.0348	176.2352	0.0000	0.0000	0.0000	0.0000	457.8052	931.1317	1447.2840	(98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)
Space heating fuel (main heating system)	1610.4963	1242.9838	1018.7851	514.9555	194.7350	0.0000	0.0000	0.0000	0.0000	505.8621	1028.8748	1599.2089	(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	219.6093	193.5301	203.1685	182.0151	176.8522	155.7615	149.2314	166.3581	167.5452	188.7447	199.7190	214.2878	(64)
Efficiency of water heater (217)m	89.0354	88.8614	88.4927	87.4157	85.1428	80.4000	80.4000	80.4000	80.4000	87.2986	88.5357	89.0572	(217)
Fuel for water heating, kWh/month	246.6539	217.7887	229.5879	208.2178	207.7126	193.7333	185.6112	206.9130	208.3895	216.2059	225.5801	240.6183	(219)
Water heating fuel used													2587.0122 (219)
Annual totals kWh/year													
Space heating fuel - main system													7715.9015 (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)													501.9212 (232)
Total delivered energy for all uses													10879.8350 (238)

10a. Fuel costs - using BEDF prices (482)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	7715.9015	6.8300	526.9961 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2587.0122	6.8300	176.6929 (247)
Pumps and fans for heating	75.0000	19.1200	14.3400 (249)
Energy for lighting	501.9212	19.1200	95.9673 (250)
Additional standing charges			62.0000 (251)
Total energy cost			875.9963 (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	7715.9015	0.2410	1859.5323 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2587.0122	0.2410	623.4699 (264)
Space and water heating			2483.0022 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	501.9212	0.5190	260.4971 (268)
Total kg/year			2782.4243 (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	7715.9015	1.0900	8410.3327 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2587.0122	1.0900	2819.8433 (264)
Space and water heating			11230.1760 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	501.9212	3.0700	1540.8981 (268)
Primary energy kWh/year			13001.3241 (272)
Primary energy kWh/m2/year			94.2398 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:
Current environmental impact rating:

D 65
C 76

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Calculation Type: Conversion (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	Recommended
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	Recommended
L2	Not considered
Q3	Not considered
O3	Not considered

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 2.4	-£ 66	-241 kg (8.7%)
U Solar photovoltaic panels	+ 7.3	-£ 371	-1006 kg (39.6%)
V2 Wind turbine	+ 15.1	-£ 684	-1856 kg (120.9%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£66	1.74 kg/m ²	D 67 C 77
Solar photovoltaic panels	£371	7.29 kg/m ²	C 75 B 84
Wind turbine	£684	13.45 kg/m ²	B 90 A 98
Total Savings	£1120	22.49 kg/m²	

Potential energy efficiency rating: B 90
 Potential environmental impact rating: A 98

Fuel prices for cost data on this page from database revision number 482 TEST (31 Aug 2021)
 Recommendation texts revision number 4.9c (22 Feb 2014)

Typical heating and lighting costs of this home (per year, Severn Valley):

	Current	Potential	Saving
Electricity	£110	£120	-£10
Bulk LPG	£766	£690	£76
Space heating	£603	£603	£0
Water heating	£177	£111	£66
Lighting	£96	£96	£0
Generated (PV)	-£0	-£371	£371
Generated (wind)	-£0	-£684	£684
Total cost of fuels	£876	-£245	£1121
Total cost of uses	£876	-£245	£1121
Delivered energy	79 kWh/m ²	31 kWh/m ²	48 kWh/m ²
Carbon dioxide emissions	2.8 tonnes	-0.3 tonnes	3.1 tonnes
CO2 emissions per m ²	20 kg/m ²	-2 kg/m ²	22 kg/m ²
Primary energy	94 kWh/m ²	-36 kWh/m ²	130 kWh/m ²

FULL SAP CALCULATION PRINTOUT

Calculation Type: Conversion (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

SAP 2012 WORKSHEET FOR Conversion (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	68.9800 (1b)	x 2.4000 (2b)	= 165.5520 (1b) - (3b)
First floor	68.9800 (1c)	x 2.9900 (2c)	= 206.2502 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	137.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 371.8022 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour							
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)							
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)							
Number of intermittent fans					5 * 10 = 50.0000 (7a)							
Number of passive vents					0 * 10 = 0.0000 (7b)							
Number of flueless gas fires					0 * 40 = 0.0000 (7c)							
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					50.0000 / (5) = 0.1345 (8)							
Pressure test					No							
Measured/design AP50					15.0000							
Infiltration rate					0.8845 (18)							
Number of sides sheltered					2 (19)							
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)							
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.7518 (21)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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	0.9586	0.9398	0.9210	0.8270	0.8082	0.7142	0.7142	0.6954	0.7518	0.8082	0.8458	0.8834 (22b)
Effective ac	0.9594	0.9416	0.9241	0.8420	0.8266	0.7551	0.7551	0.7418	0.7826	0.8266	0.8577	0.8902 (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					
Opening Type 1 window (Uw = 1.60)			19.4000	1.5038	29.1729		(27)					
Opening Type 3 velux (Uw = 1.30)			2.6900	1.2357	3.3241		(27a)					
Heat Loss Floor 1			68.9800	0.1000	6.8980	78.0000	5380.4400 (28a)					
External Wall 1 cavity	39.9600	11.8000	28.1600	0.2800	7.8848	41.6000	1171.4560 (29a)					
External Wall 2 timber frame	48.1200	7.6000	40.5200	0.1600	6.4832	20.3200	823.3664 (29a)					
External Roof 1	45.3400	2.6900	42.6500	0.1500	6.3975	9.0000	383.8500 (30)					
External Roof 2	50.2400		50.2400	0.1600	8.0384	15.7000	788.7680 (30)					
Total net area of external elements Aum(A, m ²)			252.6400				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	68.1990		(33)					
Party Wall 1			88.0800	0.0000	0.0000	70.0000	6165.6000 (32)					
Internal Wall 1			109.2000			75.0000	8190.0000 (32c)					
Internal Wall 2			143.4800			9.0000	1291.3200 (32c)					
Internal Floor 1			68.9800			18.0000	1241.6400 (32d)					
Internal Ceiling 1			68.9800			18.0000	1241.6400 (32e)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	26678.0804 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							193.3755 (35)					
Thermal bridges (Default value 0.150 * total exposed area)							37.8960 (36)					
Total fabric heat loss						(33) + (36) =	106.0950 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 117.7151	Feb 115.5262	Mar 113.3807	Apr 103.3035	May 101.4181	Jun 92.6411	Jul 92.6411	Aug 91.0157	Sep 96.0218	Oct 101.4181	Nov 105.2322	Dec 109.2198 (38)
Heat transfer coeff	223.8100	221.6212	219.4757	209.3985	207.5130	198.7361	198.7361	197.1107	202.1168	207.5130	211.3272	215.3148 (39)
Average = Sum(39)m / 12 =												209.3894 (39)
HLP	Jan 1.6223	Feb 1.6064	Mar 1.5909	Apr 1.5178	May 1.5042	Jun 1.4405	Jul 1.4405	Aug 1.4288	Sep 1.4650	Oct 1.5042	Nov 1.5318	Dec 1.5607 (40)
HLP (average)												1.5178 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.9131 (42)
Average daily hot water use (litres/day)												103.3861 (43)
Daily hot water use	113.7247	109.5893	105.4538	101.3184	97.1829	93.0475	93.0475	97.1829	101.3184	105.4538	109.5893	113.7247 (44)

FULL SAP CALCULATION PRINTOUT

Calculation Type: Conversion (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Energy content (annual)	168.6504	147.5027	152.2096	132.7000	127.3288	109.8751	101.8154	116.8347	118.2301	137.7858	150.4039	163.3289 (45)
Distribution loss (46)m = 0.15 x (45)m	25.2976	22.1254	22.8314	19.9050	19.0993	16.4813	15.2723	17.5252	17.7345	20.6679	22.5606	24.4993 (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	50.9589	46.0274	50.9589	49.3151	49.5234	45.8864	47.4160	49.5234	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	219.6093	193.5301	203.1685	182.0151	176.8522	155.7615	149.2314	166.3581	167.5452	188.7447	199.7190	214.2878 (62)
Aperture area of solar collector												3.0000 (H1)
Zero-loss collector efficiency												0.7000 (H2)
Collector heat loss coefficient												1.8000 (H3)
Collector 2nd order heat loss coefficient												0.0050 (H3a)
Collector effective heat loss coefficient												1.8063 (H3b)
Collector performance ratio												2.5804 (H4)
Annual solar radiation per m2												1079.5246 (H5)
Overshading factor												0.8000 (H6)
Solar energy available												1813.6014 (H7)
Adjustment factor for showers												1.0000 (H7a)
Solar-to-load ratio												1.1149 (H8)
Utilisation factor												0.5922 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												103.3861 (H14)
Volume ratio Veff/V												0.7254 (H15)
Solar storage volume factor												0.9358 (H16)
Solar input												-883.7166 (H17)
Solar input	-25.6260	-42.7625	-72.8294	-97.6057	-120.5836	-118.5529	-116.9862	-102.2114	-80.0520	-54.6661	-30.3961	-21.4446 (63)
Solar input (sum of months) = Sum(63)m =												-883.7166 (63)
Output from w/h	193.9833	150.7677	130.3392	84.4094	56.2686	37.2086	32.2452	64.1466	87.4931	134.0786	169.3229	192.8432 (64)
Total per year (kWh/year) = Sum(64)m =												1333.1065 (64)
Heat gains from water heating, kWh/month	68.8160	60.5515	63.3494	56.4515	54.7177	48.0051	45.7076	51.2284	51.6403	58.5535	62.3381	67.0466 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	174.7859	174.7859	174.7859	174.7859	174.7859	174.7859	174.7859	174.7859	174.7859	174.7859	174.7859	174.7859 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.0521	63.1079	51.3228	38.8546	29.0443	24.5204	26.4952	34.4394	46.2245	58.6927	68.5030	73.0269 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	458.3290	463.0850	451.1000	425.5853	393.3776	363.1069	342.8842	338.1282	350.1132	375.6279	407.8356	438.1063 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.3917	55.3917	55.3917	55.3917	55.3917	55.3917	55.3917	55.3917	55.3917	55.3917	55.3917	55.3917 (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)	-116.5239	-116.5239	-116.5239	-116.5239	-116.5239	-116.5239	-116.5239	-116.5239	-116.5239	-116.5239	-116.5239	-116.5239 (71)
Water heating gains (Table 5)	92.4946	90.1064	85.1471	78.4049	73.5453	66.6737	61.4350	68.8553	71.7226	78.7009	86.5807	90.1164 (72)
Total internal gains	738.5294	732.9530	704.2235	659.4985	612.6208	570.9547	547.4680	558.0766	584.7140	629.6752	679.5729	717.9033 (73)

6. Solar gains

[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					
Northeast			12.8000	11.2829	0.7600	0.7000	0.7700	53.2448 (75)				
Southeast			6.6000	36.7938	0.7600	0.7000	0.7700	89.5290 (77)				
Northeast			2.6900	26.0000	0.7600	0.7000	1.0000	33.4873 (82)				
Solar gains	176.2611	330.4329	527.5726	772.4211	967.9414	1004.6471	950.5092	798.9513	611.9878	386.0029	216.7339	147.1480 (83)
Total gains	914.7905	1063.3858	1231.7961	1431.9197	1580.5623	1575.6018	1497.9773	1357.0279	1196.7018	1015.6780	896.3069	865.0512 (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	33.1110	33.4380	33.7649	35.3898	35.7114	37.2885	37.2885	37.5960	36.6648	35.7114	35.0668	34.4174
alpha	3.2074	3.2292	3.2510	3.3593	3.3808	3.4859	3.4859	3.5064	3.4443	3.3808	3.3378	3.2945
util living area	0.9917	0.9858	0.9715	0.9303	0.8419	0.6878	0.5429	0.6038	0.8302	0.9570	0.9867	0.9932 (86)
MIT	20.2169	20.2754	20.3764	20.5289	20.6455	20.7311	20.7559	20.7520	20.6873	20.5327	20.3653	20.2305 (87)
Th 2	19.5970	19.6086	19.6200	19.6742	19.6844	19.7324	19.7324	19.7414	19.7138	19.6844	19.6637	19.6423 (88)
util rest of house	0.9893	0.9817	0.9628	0.9080	0.7896	0.5889	0.4040	0.4647	0.7539	0.9389	0.9822	0.9912 (89)
MIT 2	18.8725	18.9412	19.0516	19.2501	19.3665	19.4822	19.4968	19.5050	19.4338	19.2660	19.0822	18.9280 (90)
Living area fraction									fLA = Living area / (4) =			0.1469 (91)
MIT	19.0700	19.1372	19.2462	19.4380	19.5544	19.6657	19.6818	19.6882	19.6180	19.4522	19.2707	19.1194 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0700	19.1372	19.2462	19.4380	19.5544	19.6657	19.6818	19.6882	19.6180	19.4522	19.2707	19.1194 (93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: Conversion (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9882	0.9800	0.9599	0.9032	0.7834	0.5831	0.3980	0.4582	0.7469	0.9348	0.9805	0.9903	(94)
Useful gains	903.9999	1042.1397	1182.3793	1293.2741	1238.2762	918.6592	596.1412	621.8292	893.8709	949.4856	878.8166	856.6335	(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													
	3305.6717	3155.2728	2797.4842	2206.6452	1629.8927	1006.7424	612.4596	648.1456	1115.2775	1836.9367	2572.0090	3212.3651	(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													
	1786.8438	1420.0255	1201.6380	657.6272	291.3627	0.0000	0.0000	0.0000	0.0000	660.2636	1219.0986	1752.6643	(98)
Space heating													
Space heating per m2													(98) / (4) = 65.1604 (99)

8c. Space cooling requirement

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 %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													9933.1753 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1786.8438	1420.0255	1201.6380	657.6272	291.3627	0.0000	0.0000	0.0000	0.0000	660.2636	1219.0986	1752.6643	(98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)
Space heating fuel (main heating system)	1974.4130	1569.0889	1327.7768	726.6599	321.9477	0.0000	0.0000	0.0000	0.0000	729.5731	1347.0702	1936.6456	(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	193.9833	150.7677	130.3392	84.4094	56.2686	37.2086	32.2452	64.1466	87.4931	134.0786	169.3229	192.8432	(64)
Efficiency of water heater	89.4002	89.4218	89.4010	89.2250	88.6965	80.4000	80.4000	80.4000	80.4000	88.6209	89.1345	89.3870	(216)
(217)m	89.4002	89.4218	89.4010	89.2250	88.6965	80.4000	80.4000	80.4000	80.4000	88.6209	89.1345	89.3870	(217)
Fuel for water heating, kWh/month	216.9831	168.6028	145.7916	94.6029	63.4395	46.2794	40.1060	79.7844	108.8223	151.2945	189.9634	215.7398	(219)
Water heating fuel used													
Annual totals kWh/year													1521.4097 (219)
Space heating fuel - main system													9933.1753 (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)
pump for solar water heating													50.0000 (230g)
Total electricity for the above, kWh/year													125.0000 (231)
Electricity for lighting (calculated in Appendix L)													501.9212 (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)
Wind generation													-3575.5408 (234)
Total delivered energy for all uses													6778.7261 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	9933.1753	7.6000	754.9213	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1521.4097	7.6000	115.6271	(247)
Pumps and fans for heating	75.0000	13.1900	9.8925	(249)
Pump for solar water heating	50.0000	13.1900	6.5950	(249)
Energy for lighting	501.9212	13.1900	66.2034	(250)
Additional standing charges			70.0000	(251)
Energy saving/generation technologies				
PV Unit	-1727.2394	13.1900	-227.8229	(252)
Wind Turbine	-3575.5408	13.1900	-471.6138	(252)
Total energy cost			323.8027	(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] =	0.7433	(257)
SAP value		89.6307	
SAP rating (Section 12)		90	(258)
SAP band		B	

FULL SAP CALCULATION PRINTOUT

Calculation Type: Conversion (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

 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	9933.1753	0.2410	2393.8952 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1521.4097	0.2410	366.6597 (264)
Space and water heating			2760.5550 (265)
Pumps and fans	125.0000	0.5190	64.8750 (267)
Energy for lighting	501.9212	0.5190	260.4971 (268)
Energy saving/generation technologies			
PV Unit	-1727.2394	0.5190	-896.4372 (269)
Wind Turbine	-3575.5408	0.5190	-1855.7056 (269)
Total kg/year			333.7842 (272)
CO2 emissions per m2			2.4200 (273)
EI value			97.5554
EI rating			98 (274)
EI band			A

FULL SAP CALCULATION PRINTOUT

Calculation Type: Conversion (As Built)

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

SAP 2012 WORKSHEET FOR Conversion (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	68.9800 (1b)	x 2.4000 (2b)	= 165.5520 (1b) - (3b)
First floor	68.9800 (1c)	x 2.9900 (2c)	= 206.2502 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	137.9600		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 371.8022 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					5 * 10 = 50.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					50.0000 / (5) = 0.1345 (8)
Pressure test					No
Measured/design AP50					15.0000
Infiltration rate					0.8845 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.7518 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.5000	4.2000	4.3000	4.0000	4.1000	3.7000	3.9000	3.6000	3.6000	3.9000	3.9000	4.2000 (22)
Wind factor	1.1250	1.0500	1.0750	1.0000	1.0250	0.9250	0.9750	0.9000	0.9000	0.9750	0.9750	1.0500 (22a)
Adj infilt rate												
Effective ac	0.8458	0.7894	0.8082	0.7518	0.7706	0.6954	0.7330	0.6766	0.6766	0.7330	0.7330	0.7894 (22b)
	0.8577	0.8116	0.8266	0.7826	0.7969	0.7418	0.7687	0.7289	0.7289	0.7687	0.7687	0.8116 (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
Opening Type 1 window (Uw = 1.60)			19.4000	1.5038	29.1729		(27)
Opening Type 3 velux (Uw = 1.30)			2.6900	1.2357	3.3241		(27a)
Heat Loss Floor 1			68.9800	0.1000	6.8980	78.0000	5380.4400 (28a)
External Wall 1 cavity	39.9600	11.8000	28.1600	0.2800	7.8848	41.6000	1171.4560 (29a)
External Wall 2 timber frame	48.1200	7.6000	40.5200	0.1600	6.4832	20.3200	823.3664 (29a)
External Roof 1	45.3400	2.6900	42.6500	0.1500	6.3975	9.0000	383.8500 (30)
External Roof 2	50.2400		50.2400	0.1600	8.0384	15.7000	788.7680 (30)
Total net area of external elements Aum(A, m ²)			252.6400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	68.1990		(33)
Party Wall 1			88.0800	0.0000	0.0000	70.0000	6165.6000 (32)
Internal Wall 1			109.2000			75.0000	8190.0000 (32c)
Internal Wall 2			143.4800			9.0000	1291.3200 (32c)
Internal Floor 1			68.9800			18.0000	1241.6400 (32d)
Internal Ceiling 1			68.9800			18.0000	1241.6400 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	26678.0804 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							193.3755 (35)
Thermal bridges (Default value 0.150 * total exposed area)							37.8960 (36)
Total fabric heat loss						(33) + (36) =	106.0950 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	105.2322	99.5760	101.4181	96.0218	97.7772	91.0157	94.3098	89.4337	89.4337	94.3098	94.3098	99.5760 (38)
Heat transfer coeff												
Average = Sum(39)m / 12 =	211.3272	205.6709	207.5130	202.1168	203.8722	197.1107	200.4048	195.5287	195.5287	200.4048	200.4048	205.6709 (39)
												202.1295 (39)
HLP	1.5318	1.4908	1.5042	1.4650	1.4778	1.4288	1.4526	1.4173	1.4173	1.4526	1.4526	1.4908 (40)
HLP (average)												1.4651 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.9131 (42)
Average daily hot water use (litres/day)												103.3861 (43)
Daily hot water use	113.7247	109.5893	105.4538	101.3184	97.1829	93.0475	93.0475	97.1829	101.3184	105.4538	109.5893	113.7247 (44)

FULL SAP CALCULATION PRINTOUT

Calculation Type: Conversion (As Built)

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

Energy content (annual)	168.6504	147.5027	152.2096	132.7000	127.3288	109.8751	101.8154	116.8347	118.2301	137.7858	150.4039	163.3289 (45)
Distribution loss (46)m = 0.15 x (45)m	25.2976	22.1254	22.8314	19.9050	19.0993	16.4813	15.2723	17.5252	17.7345	20.6679	22.5606	24.4993 (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	50.9589	46.0274	50.9589	49.3151	49.5234	45.8864	47.4160	49.5234	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	219.6093	193.5301	203.1685	182.0151	176.8522	155.7615	149.2314	166.3581	167.5452	188.7447	199.7190	214.2878 (62)
Aperture area of solar collector												3.0000 (H1)
Zero-loss collector efficiency												0.7000 (H2)
Collector heat loss coefficient												1.8000 (H3)
Collector 2nd order heat loss coefficient												0.0050 (H3a)
Collector effective heat loss coefficient												1.8063 (H3b)
Collector performance ratio												2.5804 (H4)
Annual solar radiation per m2												1211.9476 (H5)
Overshading factor												0.8000 (H6)
Solar energy available												2036.0720 (H7)
Adjustment factor for showers												1.0000 (H7a)
Solar-to-load ratio												1.2517 (H8)
Utilisation factor												0.5502 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												103.3861 (H14)
Volume ratio Veff/V												0.7254 (H15)
Solar storage volume factor												0.9358 (H16)
Solar input												-921.7688 (H17)
Solar input	-29.2702	-42.8606	-72.9060	-101.5450	-119.2491	-127.5179	-121.0887	-107.7800	-84.7858	-56.8788	-34.0049	-23.8819 (63)
Solar input (sum of months) = Sum(63)m =												-921.7688 (63)
Output from w/h	190.3392	150.6696	130.2625	80.4701	57.6031	28.2437	28.1428	58.5780	82.7594	131.8659	165.7141	190.4059 (64)
Total per year (kWh/year) = Sum(64)m =												1295.0542 (64)
Heat gains from water heating, kWh/month	68.8160	60.5515	63.3494	56.4515	54.7177	48.0051	45.7076	51.2284	51.6403	58.5535	62.3381	67.0466 (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	174.7859	174.7859	174.7859	174.7859	174.7859	174.7859	174.7859	174.7859	174.7859	174.7859	174.7859	174.7859 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.0521	63.1079	51.3228	38.8546	29.0443	24.5204	26.4952	34.4394	46.2245	58.6927	68.5030	73.0269 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	458.3290	463.0850	451.1000	425.5853	393.3776	363.1069	342.8842	338.1282	350.1132	375.6279	407.8356	438.1063 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.3917	55.3917	55.3917	55.3917	55.3917	55.3917	55.3917	55.3917	55.3917	55.3917	55.3917	55.3917 (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)	-116.5239	-116.5239	-116.5239	-116.5239	-116.5239	-116.5239	-116.5239	-116.5239	-116.5239	-116.5239	-116.5239	-116.5239 (71)
Water heating gains (Table 5)	92.4946	90.1064	85.1471	78.4049	73.5453	66.6737	61.4350	68.8553	71.7226	78.7009	86.5807	90.1164 (72)
Total internal gains	738.5294	732.9530	704.2235	659.4985	612.6208	570.9547	547.4680	558.0766	584.7140	629.6752	679.5729	717.9033 (73)

6. Solar gains

[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							
Northeast	12.8000	14.2063	0.7600	0.7000	0.7700	67.0401 (75)						
Southeast	6.6000	44.2931	0.7600	0.7000	0.7700	107.7768 (77)						
Northeast	2.6900	33.0000	0.7600	0.7000	1.0000	42.5031 (82)						
Solar gains	217.3200	358.4758	573.6331	874.4812	1041.2869	1174.6762	1069.8533	916.8323	704.7711	435.3252	261.9297	176.7593 (83)
Total gains	955.8494	1091.4287	1277.8566	1533.9797	1653.9077	1745.6309	1617.3214	1474.9090	1289.4851	1065.0004	941.5027	894.6626 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, T _{hl} (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	35.0668	36.0312	35.7114	36.6648	36.3491	37.5960	36.9781	37.9002	37.9002	36.9781	36.9781	36.0312	36.0312
alpha	3.3378	3.4021	3.3808	3.4443	3.4233	3.5064	3.4652	3.5267	3.5267	3.4652	3.4652	3.4021	3.4021
util living area	0.9883	0.9810	0.9597	0.8974	0.7827	0.5627	0.4519	0.4694	0.7409	0.9328	0.9792	0.9904	0.9904 (86)
MIT	20.3122	20.3739	20.4619	20.5931	20.6868	20.7531	20.7604	20.7643	20.7278	20.5973	20.4550	20.3185	20.3185 (87)
Th 2	19.6637	19.6944	19.6844	19.7138	19.7042	19.7414	19.7232	19.7501	19.7501	19.7232	19.7232	19.6944	19.6944 (88)
util rest of house	0.9848	0.9753	0.9470	0.8656	0.7141	0.4497	0.3088	0.3206	0.6384	0.9037	0.9717	0.9875	0.9875 (89)
MIT 2	19.0293	19.1189	19.1957	19.3479	19.4201	19.5044	19.4884	19.5193	19.4999	19.3642	19.2265	19.0642	19.0642 (90)
Living area fraction										fLA = Living area / (4) =		0.1469	0.1469 (91)
MIT	19.2178	19.3033	19.3817	19.5308	19.6062	19.6878	19.6753	19.7022	19.6803	19.5454	19.4070	19.2485	19.2485 (92)
Temperature adjustment												0.0000	0.0000
adjusted MIT	19.2178	19.3033	19.3817	19.5308	19.6062	19.6878	19.6753	19.7022	19.6803	19.5454	19.4070	19.2485	19.2485 (93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: Conversion (As Built)

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

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9833	0.9732	0.9435	0.8602	0.7081	0.4445	0.3032	0.3146	0.6317	0.8985	0.9693	0.9863	(94)
Useful gains	939.9319	1062.1391	1205.6162	1319.4944	1171.1093	775.9983	490.3087	464.0140	814.5632	956.9291	912.6197	882.3893	(95)
Ext temp.	5.5000	6.0000	7.6000	9.8000	12.7000	15.6000	17.2000	17.3000	15.0000	11.7000	8.4000	5.5000	(96)
Heat loss rate W													
	2898.9360	2736.0980	2444.8642	1966.7649	1407.9846	805.7551	496.0648	469.7054	915.1268	1572.2587	2205.8581	2827.6636	(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													
	1457.4991	1124.9004	922.0005	466.0348	176.2352	0.0000	0.0000	0.0000	0.0000	457.8052	931.1317	1447.2840	(98)
Space heating													
Space heating per m2													50.6153 (99)

8c. Space cooling requirement

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 %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													7715.9015 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1457.4991	1124.9004	922.0005	466.0348	176.2352	0.0000	0.0000	0.0000	0.0000	457.8052	931.1317	1447.2840	(98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)
Space heating fuel (main heating system)	1610.4963	1242.9838	1018.7851	514.9555	194.7350	0.0000	0.0000	0.0000	0.0000	505.8621	1028.8748	1599.2089	(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	190.3392	150.6696	130.2625	80.4701	57.6031	28.2437	28.1428	58.5780	82.7594	131.8659	165.7141	190.4059	(64)
Efficiency of water heater	89.2056	89.1768	89.1142	88.8564	87.7835	80.4000	80.4000	80.4000	80.4000	88.0271	88.8144	89.1972	(216)
Fuel for water heating, kWh/month	213.3714	168.9561	146.1748	90.5620	65.6195	35.1290	35.0034	72.8582	102.9346	149.8014	186.5848	213.4662	(219)
Water heating fuel used													
Annual totals kWh/year													1480.4613 (219)
Space heating fuel - main system													7715.9015 (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)
pump for solar water heating													50.0000 (230g)
Total electricity for the above, kWh/year													125.0000 (231)
Electricity for lighting (calculated in Appendix L)													501.9212 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 2.50 * 1212 * 0.80) =										-1939.1161			-1939.1161 (233)
Wind generation													-3575.5408 (234)
Total delivered energy for all uses													4308.6272 (238)

10a. Fuel costs - using BEDF prices (482)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	7715.9015	6.8300	526.9961	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1480.4613	6.8300	101.1155	(247)
Pumps and fans for heating	75.0000	19.1200	14.3400	(249)
Pump for solar water heating	50.0000	19.1200	9.5600	(249)
Energy for lighting	501.9212	19.1200	95.9673	(250)
Additional standing charges			62.0000	(251)
Energy saving/generation technologies				
PV Unit		-1939.1161	19.1200	-370.7590 (252)
Wind Turbine		-3575.5408	19.1200	-683.6434 (252)
Total energy cost				-244.4235 (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	7715.9015	0.2410	1859.5323	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1480.4613	0.2410	356.7912	(264)
Space and water heating			2216.3234	(265)
Pumps and fans	125.0000	0.5190	64.8750	(267)
Energy for lighting	501.9212	0.5190	260.4971	(268)

FULL SAP CALCULATION PRINTOUT

Calculation Type: Conversion (As Built)

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

Energy saving/generation technologies			
PV Unit	-1939.1161	0.5190	-1006.4013 (269)
Wind Turbine	-3575.5408	0.5190	-1855.7056 (269)
Total kg/year			-320.4114 (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	7715.9015	1.0900	8410.3327 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1480.4613	1.0900	1613.7028 (264)
Space and water heating			10024.0355 (265)
Pumps and fans	125.0000	3.0700	383.7500 (267)
Energy for lighting	501.9212	3.0700	1540.8981 (268)
Energy saving/generation technologies			
PV Unit	-1939.1161	3.0700	-5953.0866 (269)
Wind Turbine	-3575.5408	3.0700	-10976.9101 (269)
Primary energy kWh/year			-4981.3131 (272)
Primary energy kWh/m2/year			-36.1069 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: Conversion (As Built)

Property Reference	200046			Issued on Date	28/09/2021
Assessment Reference	001	Prop Type Ref	4 Brinsea Batch BS49 5JP		
Property	Oak View, Brinsea, Congresbury, BRISTOL, BS49 5JP				
SAP Rating	65 D	DER	N/A	TER	N/A
Environmental	76 C	% DER<TER	N/A		
CO ₂ Emissions (t/year)	2.78	DFEE	N/A	TFEE	N/A
General Requirements Compliance	N/A	% DFEE<TFEE	N/A		
Assessor Details	Mr. Michael Heinemans, DEA 4 U, Tel: 01275 878257, mhmb@yahoo.co.uk			Assessor ID	D395-0001
Client					