

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

Property Reference	078 - PRJ013014			Issued on Date	14/04/2025
Assessment Reference	078	Prop Type Ref	2B		
Property	11 Erwood Close, Netley Abbey, Southampton, SO31 5TJ				
SAP Rating	85 B	DER	14.83	TER	18.29
Environmental	88 B	% DER<TER	18.91		
CO ₂ Emissions (t/year)	1.02	DFEE	44.69	TFEE	50.94
General Requirements Compliance	Pass	% DFEE<TFEE	12.28		
Assessor Details	Mr. Christopher Nicholls, Briary Energy Limited, Tel: 0203 397 1373, chris@briaryenergy.co.uk			Assessor ID	4299-0004
Client					

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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

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DWELLING AS BUILT

Semi-Detached House, total floor area 82 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas

Fuel factor:1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 18.29 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 14.83 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)50.9 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)44.7 kWh/m²/yrOK

2 Fabric U-values

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

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.29 (measured in this dwelling)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas

Data from database

Vaillant ecoFIT sustain 835 VUW 356/6-3 (H-GB)

Combi boiler

Efficiency: 89.3% SEDBUK2009

Minimum: 88.0% OK

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls:

No cylinder

Boiler interlock

Yes

OK

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Southern England): Slight OK

Based on:

Overshading:

Average

Windows facing East: 7.17 m², No overhang

Windows facing West: 2.72 m², No overhang

Air change rate: 4.66 ach

Blinds/curtains: Dark-coloured curtain or roller blind, closed 100% of daylight hours

10 Key features

Party wall U-value 0.00 W/m²K

Roof U-value 0.08 W/m²K

Air permeability 3.3 m³/m²h

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 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					3.2900
Infiltration rate					0.3108 (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) =	0.2875 (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	0.3666	0.3594	0.3522	0.3163	0.3091	0.2732	0.2732	0.2660	0.2875	0.3091	0.3235	0.3379 (22b)
Effective ac	0.5672	0.5646	0.5620	0.5500	0.5478	0.5373	0.5373	0.5354	0.5413	0.5478	0.5523	0.5571 (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	38.3691	38.1926	38.0196	37.2069	37.0548	36.3470	36.3470	36.2159	36.6196	37.0548	37.3624	37.6840 (38)
Heat transfer coeff	96.7921	96.6156	96.4426	95.6299	95.4778	94.7700	94.7700	94.6389	95.0426	95.4778	95.7854	96.1070 (39)
Average = Sum(39)m / 12 =												95.6291 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1781	1.1759	1.1738	1.1639	1.1621	1.1535	1.1535	1.1519	1.1568	1.1621	1.1658	1.1698 (40)
HLP (average)												1.1639 (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
	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)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 1033.8598 (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	125.1284	125.1284	125.1284	125.1284	125.1284	125.1284	125.1284	125.1284	125.1284	125.1284	125.1284	125.1284 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.0027	19.5426	15.8931	12.0321	8.9942	7.5933	8.2048	10.6649	14.3144	18.1754	21.2134	22.6143 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	223.8956	226.2189	220.3642	207.9002	192.1666	177.3792	167.5003	165.1770	171.0317	183.4958	199.2294	214.0167 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.5128	35.5128	35.5128	35.5128	35.5128	35.5128	35.5128	35.5128	35.5128	35.5128	35.5128	35.5128 (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	377.9253	375.6223	361.6036	339.1454	316.3906	294.5977	280.5721	286.8115	298.4884	321.1603	347.0995	366.4969 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W		
East				7.1650	19.6403	0.7300	0.7200	0.7700		51.2569 (76)		
West				2.7240	19.6403	0.7300	0.7200	0.7700		19.4869 (80)		
Solar gains	70.7438	138.3898	227.9084	332.3908	407.3574	417.0027	397.0036	341.0202	265.0669	164.2112	88.2092	58.1762 (83)
Total gains	448.6691	514.0122	589.5120	671.5362	723.7479	711.6004	677.5758	627.8317	563.5552	485.3715	435.3087	424.6732 (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	15.6855	15.7141	15.7423	15.8761	15.9014	16.0202	16.0202	16.0423	15.9742	15.9014	15.8503	15.7973
alpha	2.0457	2.0476	2.0495	2.0584	2.0601	2.0680	2.0680	2.0695	2.0649	2.0601	2.0567	2.0532
util living area	0.9464	0.9282	0.8939	0.8311	0.7391	0.6189	0.5034	0.5458	0.7232	0.8683	0.9302	0.9517 (86)
MIT	17.7943	18.0965	18.6516	19.3788	20.0438	20.5484	20.7937	20.7478	20.3261	19.4519	18.4946	17.7323 (87)
Th 2	19.9376	19.9393	19.9410	19.9490	19.9504	19.9574	19.9574	19.9587	19.9547	19.9504	19.9474	19.9443 (88)
util rest of house	0.9400	0.9196	0.8808	0.8088	0.7013	0.5558	0.4117	0.4560	0.6694	0.8461	0.9204	0.9459 (89)
MIT 2	15.6706	16.1041	16.8979	17.9286	18.8469	19.5137	19.8023	19.7589	19.2472	18.0519	16.6848	15.5832 (90)
Living area fraction									fLA = Living area / (4) =			0.1671 (91)
MIT	16.0255	16.4371	17.1910	18.1710	19.0469	19.6866	19.9680	19.9241	19.4275	18.2858	16.9872	15.9423 (92)
Temperature adjustment												-0.1500
adjusted MIT	15.8755	16.2871	17.0410	18.0210	18.8969	19.5366	19.8180	19.7741	19.2775	18.1358	16.8372	15.7923 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9017	0.8756	0.8303	0.7560	0.6556	0.5267	0.3981	0.4381	0.6271	0.7935	0.8767	0.9098 (94)
Useful gains	404.5842	450.0699	489.4550	507.6978	474.4843	374.8305	269.7506	275.0366	353.4041	385.1188	381.6545	386.3829 (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	1120.4138	1100.1677	1016.5968	872.2378	687.1489	467.8412	304.9713	319.3247	492.0872	719.5051	932.6834	1114.1033 (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	532.5772	436.8657	392.1935	262.4688	158.2225	0.0000	0.0000	0.0000	0.0000	248.7835	396.7408	541.4240 (98)
Space heating												2969.2761 (98)
Space heating per m2												(98) / (4) = 36.1402 (99)

8c. Space cooling requirement

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Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												90.2000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												3291.8803 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	532.5772	436.8657	392.1935	262.4688	158.2225	0.0000	0.0000	0.0000	0.0000	248.7835	396.7408	541.4240 (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)	590.4404	484.3301	434.8044	290.9854	175.4129	0.0000	0.0000	0.0000	0.0000	275.8132	439.8457	600.2484 (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	87.6180	87.4867	87.1584	86.4145	84.9716	76.4000	76.4000	76.4000	76.4000	86.1111	87.1726	76.4000 (216)
Fuel for water heating, kWh/month	118.5001	103.5116	107.7542	97.2451	96.2021	93.9941	90.0431	101.3838	101.9729	103.0349	108.3335	114.7422 (219)
Water heating fuel used												1236.7177 (219)
Annual totals kWh/year												
Space heating fuel - main system												3291.8803 (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												4992.1734 (238)

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	3291.8803	0.2160	711.0462 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1236.7177	0.2160	267.1310 (264)
Space and water heating			978.1772 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	388.5754	0.5190	201.6706 (268)
Total CO2, kg/year			1218.7728 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			14.8300 (273)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		14.8300 ZC1
Total Floor Area	TFA	82.1600
Assumed number of occupants	N	2.5026
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.1485 ZC2
CO2 emissions from cooking, equation (L16)		2.1794 ZC3
Total CO2 emissions		33.1579 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		33.1579 ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 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					5.0000
Infiltration rate					0.3963 (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) =	0.3666 (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	0.4674	0.4583	0.4491	0.4033	0.3941	0.3483	0.3483	0.3391	0.3666	0.3941	0.4125	0.4308 (22b)
Effective ac	0.6093	0.6050	0.6009	0.5813	0.5777	0.5607	0.5607	0.5575	0.5672	0.5777	0.5851	0.5928 (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
TER Opaque door			2.0900	1.0000	2.0900		(26)
TER Opening Type (Uw = 1.40)			9.8900	1.3258	13.1117		(27)
Flr - Ground			41.0820	0.1300	5.3407		(28a)
Wl - Brick (Timber Frame)	90.5550	11.9790	78.5760	0.1800	14.1437		(29a)
Rf - Ins Joist	41.0820		41.0820	0.1300	5.3407		(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) =	40.0267		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.8841 (36)
Total fabric heat loss						(33) + (36) =	48.9108 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	41.2137	40.9267	40.6454	39.3242	39.0770	37.9262	37.9262	37.7131	38.3695	39.0770	39.5771	40.0999 (38)
Heat transfer coeff	90.1246	89.8376	89.5563	88.2350	87.9878	86.8371	86.8371	86.6240	87.2803	87.9878	88.4879	89.0107 (39)
Average = Sum(39)m / 12 =												88.2339 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0969	1.0934	1.0900	1.0739	1.0709	1.0569	1.0569	1.0543	1.0623	1.0709	1.0770	1.0834 (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												

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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	45.6841	48.6702	45.2531	44.8529	41.5590	42.9443	44.8529	45.2531	48.6702	48.9473	50.9589 (61)
Solar input	203.7043	179.2762	186.5253	165.4385	160.1737	141.0721	135.1578	150.6692	152.3332	173.4617	185.1670	198.8847 (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)
Heat gains from water heating, kWh/month	203.7043	179.2762	186.5253	165.4385	160.1737	141.0721	135.1578	150.6692	152.3332	173.4617	185.1670	198.8847 (64)
	63.5276	55.8404	58.0044	51.2749	49.5574	43.4778	41.3971	46.3972	46.9174	53.6607	57.5299	61.9251 (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	125.1284	125.1284	125.1284	125.1284	125.1284	125.1284	125.1284	125.1284	125.1284	125.1284	125.1284	125.1284	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.1406	19.6651	15.9927	12.1075	9.0505	7.6408	8.2562	10.7317	14.4041	18.2893	21.3463	22.7559	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	223.8956	226.2189	220.3642	207.9002	192.1666	177.3792	167.5003	165.1770	171.0317	183.4958	199.2294	214.0167	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.5128	35.5128	35.5128	35.5128	35.5128	35.5128	35.5128	35.5128	35.5128	35.5128	35.5128	35.5128	(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)	85.3865	83.0958	77.9629	71.2152	66.6094	60.3859	55.6412	62.3618	65.1631	72.1246	79.9026	83.2326	(72)
Total internal gains	394.9612	392.5184	377.8583	354.7614	331.3650	308.9444	294.9362	301.8090	314.1374	337.4482	364.0167	383.5438	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W
East					7.1650	19.6403	0.6300	0.7000			0.7700	43.0066
West					2.7240	19.6403	0.6300	0.7000			0.7700	16.3503 (80)

Solar gains	59.3569	116.1148	191.2245	278.8895	341.7896	349.8824	333.1024	286.1300	222.4020	137.7800	74.0111	48.8123 (83)
Total gains	454.3182	508.6331	569.0828	633.6509	673.1546	658.8269	628.0386	587.9390	536.5394	475.2281	438.0279	432.3561 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (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	63.3074	63.5097	63.7092	64.6632	64.8448	65.7042	65.7042	65.8658	65.3705	64.8448	64.4784	64.0996	
alpha	5.2205	5.2340	5.2473	5.3109	5.3230	5.3803	5.3803	5.3911	5.3580	5.3230	5.2986	5.2733	
util living area	0.9987	0.9973	0.9926	0.9736	0.9115	0.7638	0.5912	0.6485	0.8871	0.9851	0.9973	0.9990	(86)
MIT	19.7865	19.9153	20.1520	20.4775	20.7626	20.9389	20.9875	20.9800	20.8533	20.4816	20.0812	19.7694	(87)
Th 2	20.0033	20.0062	20.0090	20.0222	20.0246	20.0362	20.0362	20.0383	20.0317	20.0246	20.0196	20.0144	(88)
util rest of house	0.9982	0.9963	0.9898	0.9629	0.8751	0.6781	0.4705	0.5273	0.8273	0.9773	0.9962	0.9986	(89)
MIT 2	18.3774	18.5677	18.9146	19.3920	19.7811	19.9931	20.0313	20.0295	19.9061	19.4049	18.8202	18.3605	(90)
Living area fraction	18.6129	18.7929	19.1214	19.5734	19.9451	20.1512	20.1911	20.1883	20.0644	19.5849	19.0309	18.5960	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6129	18.7929	19.1214	19.5734	19.9451	20.1512	20.1911	20.1883	20.0644	19.5849	19.0309	18.5960	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	453.0491	505.8774	561.2611	606.1199	586.7102	454.1630	308.1636	321.7533	445.1748	462.0781	435.5952	431.4241	(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	1289.9437	1248.1057	1130.3232	941.7671	725.4706	482.0468	311.8364	328.1607	520.5725	790.5583	1055.7442	1281.3946	(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	622.6495	498.7774	423.3822	241.6660	103.2377	0.0000	0.0000	0.0000	0.0000	244.3893	446.5073	632.3780	(98)
Space heating												3212.9876	(98)
Space heating per m2												39.1065	(99)

8c. Space cooling requirement

Not applicable

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

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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 %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3440.0295 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	622.6495	498.7774	423.3822	241.6660	103.2377	0.0000	0.0000	0.0000	0.0000	244.3893	446.5073	632.3780	(98)
Space heating efficiency (main heating system 1)	93.4000	93.4000	93.4000	93.4000	93.4000	0.0000	0.0000	0.0000	0.0000	93.4000	93.4000	93.4000	(210)
Space heating fuel (main heating system)	666.6483	534.0229	453.3000	258.7431	110.5329	0.0000	0.0000	0.0000	0.0000	261.6587	478.0592	677.0643	(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	203.7043	179.2762	186.5253	165.4385	160.1737	141.0721	135.1578	150.6692	152.3332	173.4617	185.1670	198.8847	(64)
Efficiency of water heater	87.6814	87.4905	87.0515	86.0040	83.9772	80.3000	80.3000	80.3000	80.3000	85.9141	87.1854	87.7590	(217)
Fuel for water heating, kWh/month	232.3233	204.9095	214.2702	192.3614	190.7347	175.6813	168.3160	187.6329	189.7051	201.9014	212.3829	226.6259	(219)
Water heating fuel used												2396.8447	(219)
Annual totals kWh/year													
Space heating fuel - main system												3440.0295	(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)												391.0097	(232)
Total delivered energy for all uses												6302.8839	(238)

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	3440.0295	0.2160	743.0464 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2396.8447	0.2160	517.7184 (264)
Space and water heating			1260.7648 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	391.0097	0.5190	202.9341 (268)
Total CO2, kg/m2/year			1502.6239 (272)
Emissions per m2 for space and water heating			15.3452 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4700 (272b)
Emissions per m2 for pumps and fans			0.4738 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.3452 * 1.00) + 2.4700 + 0.4738, rounded to 2 d.p.			18.2900 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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 * 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					3.2900
Infiltration rate					0.3108 (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) =				0.2875 (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	0.3522	0.3307	0.3235	0.3019	0.3019	0.2947	0.2947	0.2875	0.2875	0.3091	0.3091	0.3163 (22b)
Effective ac	0.5620	0.5547	0.5523	0.5456	0.5456	0.5434	0.5434	0.5413	0.5413	0.5478	0.5478	0.5500 (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	38.0196	37.5214	37.3624	36.9062	36.9062	36.7612	36.7612	36.6196	36.6196	37.0548	37.0548	37.2069 (38)
Heat transfer coeff	96.4426	95.9445	95.7854	95.3293	95.3293	95.1842	95.1842	95.0426	95.0426	95.4778	95.4778	95.6299 (39)
Average = Sum(39)m / 12 =												95.4892 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1738	1.1678	1.1658	1.1603	1.1603	1.1585	1.1585	1.1568	1.1568	1.1621	1.1621	1.1639 (40)
HLP (average)												1.1622 (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)
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)
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	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	
East						7.1650	25.1733	0.7300	0.7200	0.7700	65.6968 (76)	
West						2.7240	25.1733	0.7300	0.7200	0.7700	24.9767 (80)	
Solar gains	90.6735	150.8874	252.1752	369.4684	426.0695	481.2408	442.9439	396.9031	308.6742	195.4677	112.6891	73.2937 (83)
Total gains	653.9107	709.2758	788.1869	871.0914	892.6313	916.6250	860.3542	823.0985	754.9045	676.3004	631.7674	621.1541 (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	15.7423	15.8240	15.8503	15.9262	15.9262	15.9504	15.9504	15.9742	15.9742	15.9014	15.9014	15.8761
alpha	2.0495	2.0549	2.0567	2.0617	2.0617	2.0634	2.0634	2.0649	2.0649	2.0601	2.0601	2.0584
util living area	0.8854	0.8648	0.8154	0.7306	0.6147	0.4513	0.3347	0.3382	0.5449	0.7394	0.8467	0.8925 (86)
MIT	18.5838	18.7947	19.2930	19.9085	20.4460	20.8053	20.9291	20.9301	20.6976	20.1046	19.2938	18.5664 (87)
Th 2	19.9410	19.9459	19.9474	19.9519	19.9519	19.9533	19.9533	19.9547	19.9547	19.9504	19.9504	19.9490 (88)
util rest of house	0.8722	0.8495	0.7941	0.6984	0.5643	0.3769	0.2385	0.2381	0.4710	0.6988	0.8260	0.8800 (89)
MIT 2	16.7960	17.0948	17.7962	18.6478	19.3627	19.7943	19.9167	19.9199	19.6868	18.9348	17.8128	16.7756 (90)
Living area fraction									fLA = Living area / (4) =			0.1671 (91)
MIT	17.0948	17.3789	18.0464	18.8585	19.5437	19.9632	20.0858	20.0887	19.8557	19.1303	18.0603	17.0749 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.9448	17.2289	17.8964	18.7085	19.3937	19.8132	19.9358	19.9387	19.7057	18.9803	17.9103	16.9249 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	536.8171	565.2635	584.6188	568.9114	476.7499	335.6570	203.7210	194.6233	340.7210	441.8286	488.4066	515.3584 (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	1084.4757	1067.7545	976.6640	820.6415	599.9751	372.4783	212.8175	203.2667	399.7215	637.8217	869.8298	1063.8721 (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	407.4580	337.6740	291.6816	181.2457	91.6795	0.0000	0.0000	0.0000	0.0000	145.8189	274.6247	408.0942 (98)
Space heating												2138.2766 (98)
RHI space heating demand												2138 (98)

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CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	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	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1463 (8)
Pressure test					Yes
Measured/design AP50					3.2900
Infiltration rate					0.3108 (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) =	0.2875 (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	0.3666	0.3594	0.3522	0.3163	0.3091	0.2732	0.2732	0.2660	0.2875	0.3091	0.3235	0.3379 (22b)
Effective ac	0.5672	0.5646	0.5620	0.5500	0.5478	0.5373	0.5373	0.5354	0.5413	0.5478	0.5523	0.5571 (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	38.3691	38.1926	38.0196	37.2069	37.0548	36.3470	36.3470	36.2159	36.6196	37.0548	37.3624	37.6840 (38)
Heat transfer coeff	96.7921	96.6156	96.4426	95.6299	95.4778	94.7700	94.7700	94.6389	95.0426	95.4778	95.7854	96.1070 (39)
Average = Sum(39)m / 12 =												95.6291 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1781	1.1759	1.1738	1.1639	1.1621	1.1535	1.1535	1.1519	1.1568	1.1621	1.1658	1.1698 (40)
HLP (average)												1.1639 (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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CALCULATION OF ENERGY RATINGS 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)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 1033.8598 (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	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
East					7.1650	19.6403	0.7300	0.7200			0.7700			51.2569 (76)
West					2.7240	19.6403	0.7300	0.7200			0.7700			19.4869 (80)

Solar gains	70.7438	138.3898	227.9084	332.3908	407.3574	417.0027	397.0036	341.0202	265.0669	164.2112	88.2092	58.1762	(83)	
Total gains	633.9810	696.7782	763.9201	834.0138	873.9192	852.3870	814.4139	767.2157	711.2971	645.0439	607.2875	606.0366	(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	15.6855	15.7141	15.7423	15.8761	15.9014	16.0202	16.0202	16.0423	15.9742	15.9014	15.8503	15.7973
alpha	2.0457	2.0476	2.0495	2.0584	2.0601	2.0680	2.0680	2.0695	2.0649	2.0601	2.0567	2.0532
util living area	0.9049	0.8833	0.8439	0.7751	0.6786	0.5549	0.4402	0.4753	0.6460	0.8034	0.8810	0.9120 (86)
MIT	18.1952	18.4690	18.9688	19.6178	20.2011	20.6368	20.8410	20.8076	20.4671	19.7141	18.8464	18.1334 (87)
Th 2	19.9376	19.9393	19.9410	19.9490	19.9504	19.9574	19.9574	19.9587	19.9547	19.9504	19.9474	19.9443 (88)
util rest of house	0.8946	0.8707	0.8265	0.7486	0.6377	0.4920	0.3546	0.3903	0.5883	0.7746	0.8660	0.9024 (89)
MIT 2	16.2387	16.6281	17.3370	18.2481	19.0429	19.6080	19.8411	19.8108	19.4099	18.4021	17.1772	16.1529 (90)
Living area fraction									fLA = Living area / (4) =			0.1671 (91)
MIT	16.5657	16.9358	17.6097	18.4770	19.2364	19.7800	20.0082	19.9774	19.5866	18.6214	17.4561	16.4839 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.4157	16.7858	17.4597	18.3270	19.0864	19.6300	19.8582	19.8274	19.4366	18.4714	17.3061	16.3339 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.8458	0.8192	0.7732	0.6988	0.5989	0.4702	0.3458	0.3785	0.5554	0.7231	0.8144	0.8551 (94)
Useful gains	536.1987	570.7909	590.6916	582.8347	523.3801	400.7602	281.5944	290.4241	395.0227	466.4077	494.5825	518.2023 (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	1172.7015	1148.3506	1056.9799	901.5007	705.2397	476.6897	308.7806	324.3620	507.2040	751.5423	977.5958	1166.1504 (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	473.5581	388.1201	346.9185	229.4395	135.3035	0.0000	0.0000	0.0000	0.0000	212.1401	347.7695	482.0734 (98)
Space heating												2615.3228 (98)
Space heating per m2										(98) / (4) =		31.8321 (99)

8c. Space cooling requirement

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Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												90.2000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												2899.4710	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	473.5581	388.1201	346.9185	229.4395	135.3035	0.0000	0.0000	0.0000	0.0000	212.1401	347.7695	482.0734	(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)	525.0090	430.2884	384.6104	254.3675	150.0039	0.0000	0.0000	0.0000	0.0000	235.1886	385.5538	534.4494	(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	87.3624	87.2195	86.8576	86.0341	84.4547	76.4000	76.4000	76.4000	76.4000	85.6383	86.8498	76.4000	(216)
(217)m	87.3624	87.2195	86.8576	86.0341	84.4547	76.4000	76.4000	76.4000	76.4000	85.6383	86.8498	87.4711	(217)
Fuel for water heating, kWh/month	118.8469	103.8287	108.1274	97.6751	96.7909	93.9941	90.0431	101.3838	101.9729	103.6038	108.7362	115.0640	(219)
Water heating fuel used												1240.0668	(219)
Annual totals kWh/year													
Space heating fuel - main system												2899.4710	(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												4603.1132	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2899.4710	3.4800	100.9016 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1240.0668	3.4800	43.1543 (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			325.2015 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.4200 (256)
Energy cost factor (ECF)	1.0741 (257)
SAP value	85.0161
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	2899.4710	0.2160	626.2857 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1240.0668	0.2160	267.8544 (264)
Space and water heating			894.1402 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	388.5754	0.5190	201.6706 (268)
Total kg/year			1134.7358 (272)
CO2 emissions per m2			13.8100 (273)
EI value			88.0423
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	$3.48 / 0.8312 = 4.187$, stars = 5
Water heating environmental impact	$0.216 / 0.8312 = 0.2599$, stars = 5

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FULL SAP CALCULATION PRINTOUT

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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					3.2900
Infiltration rate					0.3108 (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) =	0.2875 (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	0.3522	0.3307	0.3235	0.3019	0.3019	0.2947	0.2947	0.2875	0.2875	0.3091	0.3091	0.3163 (22b)
Effective ac	0.5620	0.5547	0.5523	0.5456	0.5456	0.5434	0.5434	0.5413	0.5413	0.5478	0.5478	0.5500 (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	38.0196	37.5214	37.3624	36.9062	36.9062	36.7612	36.7612	36.6196	36.6196	37.0548	37.0548	37.2069 (38)
Heat transfer coeff	96.4426	95.9445	95.7854	95.3293	95.3293	95.1842	95.1842	95.0426	95.0426	95.4778	95.4778	95.6299 (39)
Average = Sum(39)m / 12 =												95.4892 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1738	1.1678	1.1658	1.1603	1.1603	1.1585	1.1585	1.1568	1.1568	1.1621	1.1621	1.1639 (40)
HLP (average)												1.1622 (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)

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												2370.5949 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	407.4580	337.6740	291.6816	181.2457	91.6795	0.0000	0.0000	0.0000	0.0000	145.8189	274.6247	408.0942 (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)	451.7273	374.3614	323.3720	200.9376	101.6403	0.0000	0.0000	0.0000	0.0000	161.6617	304.4620	452.4326 (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	87.0085	86.8813	86.3990	85.3182	83.1229	76.4000	76.4000	76.4000	76.4000	84.4309	86.2151	76.4000 (216)
Fuel for water heating, kWh/month	119.3302	104.2328	108.7014	98.4947	98.3417	93.9941	90.0431	101.3838	101.9729	105.0853	109.5366	115.5702 (219)
Water heating fuel used												1246.6869 (219)
Annual totals kWh/year												
Space heating fuel - main system												2370.5949 (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												4080.8572 (238)

10a. Fuel costs - using BEDF prices (568)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2370.5949	5.7300	135.8351 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1246.6869	5.7300	71.4352 (247)
Pumps and fans for heating	75.0000	24.1800	18.1350 (249)
Energy for lighting	388.5754	24.1800	93.9575 (250)
Additional standing charges			114.0000 (251)
Total energy cost			433.3628 (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	2370.5949	0.2160	512.0485 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1246.6869	0.2160	269.2844 (264)
Space and water heating			781.3329 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	388.5754	0.5190	201.6706 (268)
Total kg/year			1021.9285 (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	2370.5949	1.2200	2892.1258 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1246.6869	1.2200	1520.9580 (264)
Space and water heating			4413.0837 (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			5836.2603 (272)
Primary energy kWh/m2/year			71.0353 (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	-£ 471	-1010 kg (98.9%)

Measures omitted - SAP change or cost saving too small:

N Solar water heating	+ 0.9	-£ 33	-143 kg (14.0%)
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Recommended measures	Typical annual savings		Energy efficiency	Environmental impact
Solar photovoltaic panels	£471	12.30 kg/m²	A 96	A 97
Total Savings	£471	12.30 kg/m²		
Potential energy efficiency rating:			A 96	
Potential environmental impact rating:				A 97

Fuel prices for cost data on this page from database revision number 568 TEST (31 Mar 2025)
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	£112	£112	£0
Mains gas	£321	£321	£0
Space heating	£268	£268	£0
Water heating	£71	£71	£0
Lighting	£94	£94	£0
Generated (PV)	-£0	-£471	£471
Total cost of fuels	£433	-£38	£471
Total cost of uses	£433	-£38	£471
Delivered energy	50 kWh/m²	26 kWh/m²	24 kWh/m²
Carbon dioxide emissions	1.0 tonnes	0.0 tonnes	1.0 tonnes
CO2 emissions per m²	12 kg/m²	0 kg/m²	12 kg/m²
Primary energy	71 kWh/m²	-2 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)
					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					3.2900
Infiltration rate					0.3108 (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) = 0.2875 (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	0.3666	0.3594	0.3522	0.3163	0.3091	0.2732	0.2732	0.2660	0.2875	0.3091	0.3235	0.3379 (22b)
Effective ac	0.5672	0.5646	0.5620	0.5500	0.5478	0.5373	0.5373	0.5354	0.5413	0.5478	0.5523	0.5571 (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	38.3691	38.1926	38.0196	37.2069	37.0548	36.3470	36.3470	36.2159	36.6196	37.0548	37.3624	37.6840 (38)
Heat transfer coeff	96.7921	96.6156	96.4426	95.6299	95.4778	94.7700	94.7700	94.6389	95.0426	95.4778	95.7854	96.1070 (39)
Average = Sum(39)m / 12 =												95.6291 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1781	1.1759	1.1738	1.1639	1.1621	1.1535	1.1535	1.1519	1.1568	1.1621	1.1658	1.1698 (40)
HLP (average)												1.1639 (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
	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												

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
East					7.1650	19.6403	0.7300	0.7200			0.7700			51.2569
West					2.7240	19.6403	0.7300	0.7200			0.7700			19.4869 (76)
Solar gains	70.7438	138.3898	227.9084	332.3908	407.3574	417.0027	397.0036	341.0202	265.0669	164.2112	88.2092	58.1762 (83)		
Total gains	633.9810	696.7782	763.9201	834.0138	873.9192	852.3870	814.4139	767.2157	711.2971	645.0439	607.2875	606.0366 (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, n11,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	15.6855	15.7141	15.7423	15.8761	15.9014	16.0202	16.0202	16.0423	15.9742	15.9014	15.8503	15.7973	
alpha	2.0457	2.0476	2.0495	2.0584	2.0601	2.0680	2.0680	2.0695	2.0649	2.0601	2.0567	2.0532	
util living area	0.9049	0.8833	0.8439	0.7751	0.6786	0.5549	0.4402	0.4753	0.6460	0.8034	0.8810	0.9120	(86)
MIT	18.1952	18.4690	18.9688	19.6178	20.2011	20.6368	20.8410	20.8076	20.4671	19.7141	18.8464	18.1334	(87)
Th 2	19.9376	19.9393	19.9410	19.9490	19.9504	19.9574	19.9574	19.9587	19.9547	19.9504	19.9474	19.9443	(88)
util rest of house	0.8946	0.8707	0.8265	0.7486	0.6377	0.4920	0.3546	0.3903	0.5883	0.7746	0.8660	0.9024	(89)
MIT 2	16.2387	16.6281	17.3370	18.2481	19.0429	19.6080	19.8411	19.8108	19.4099	18.4021	17.1772	16.1529	(90)
Living area fraction									fLA = Living area / (4) =			0.1671	(91)
MIT	16.5657	16.9358	17.6097	18.4770	19.2364	19.7800	20.0082	19.9774	19.5866	18.6214	17.4561	16.4839	(92)
Temperature adjustment												-0.1500	
adjusted MIT	16.4157	16.7858	17.4597	18.3270	19.0864	19.6300	19.8582	19.8274	19.4366	18.4714	17.3061	16.3339	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.8458	0.8192	0.7732	0.6988	0.5989	0.4702	0.3458	0.3785	0.5554	0.7231	0.8144	0.8551	(94)
Useful gains	536.1987	570.7909	590.6916	582.8347	523.3801	400.7602	281.5944	290.4241	395.0227	466.4077	494.5825	518.2023	(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	1172.7015	1148.3506	1056.9799	901.5007	705.2397	476.6897	308.7806	324.3620	507.2040	751.5423	977.5958	1166.1504	(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	473.5581	388.1201	346.9185	229.4395	135.3035	0.0000	0.0000	0.0000	0.0000	212.1401	347.7695	482.0734	(98)
Space heating												2615.3228	(98)
Space heating per m2												(98) / (4) =	31.8321 (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												2899.4710	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	473.5581	388.1201	346.9185	229.4395	135.3035	0.0000	0.0000	0.0000	0.0000	212.1401	347.7695	482.0734	(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)	525.0090	430.2884	384.6104	254.3675	150.0039	0.0000	0.0000	0.0000	0.0000	235.1886	385.5538	534.4494	(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	87.3624	87.2195	86.8576	86.0341	84.4547	76.4000	76.4000	76.4000	76.4000	85.6383	86.8498	76.4000	(216)
Fuel for water heating, kWh/month	118.8469	103.8287	108.1274	97.6751	96.7909	93.9941	90.0431	101.3838	101.9729	103.6038	108.7362	115.0640	(219)
Water heating fuel used												1240.0668	(219)
Annual totals kWh/year													
Space heating fuel - main system												2899.4710	(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												2875.8738	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2899.4710	3.4800	100.9016 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1240.0668	3.4800	43.1543 (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			97.3786 (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] =	0.3216 (257)
SAP value	95.5132	
SAP rating (Section 12)	96	(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	2899.4710	0.2160	626.2857	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1240.0668	0.2160	267.8544	(264)
Space and water heating			894.1402	(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			238.2986	(272)
CO2 emissions per m2			2.9000	(273)
EI value			97.4888	
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	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					30.0000 / (5) = 0.1463 (8)
Pressure test					Yes
Measured/design AP50					3.2900
Infiltration rate					0.3108 (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)	=	0.2875 (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	0.3522	0.3307	0.3235	0.3019	0.3019	0.2947	0.2947	0.2875	0.2875	0.3091	0.3091	0.3163 (22b)
Effective ac	0.5620	0.5547	0.5523	0.5456	0.5456	0.5434	0.5434	0.5413	0.5413	0.5478	0.5478	0.5500 (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	38.0196	37.5214	37.3624	36.9062	36.9062	36.7612	36.7612	36.6196	36.6196	37.0548	37.0548	37.2069 (38)
Heat transfer coeff	96.4426	95.9445	95.7854	95.3293	95.3293	95.1842	95.1842	95.0426	95.0426	95.4778	95.4778	95.6299 (39)
Average = Sum(39)m / 12 =												95.4892 (39)
HLP	1.1738	1.1678	1.1658	1.1603	1.1603	1.1585	1.1585	1.1568	1.1568	1.1621	1.1621	1.1639 (40)
HLP (average)												1.1622 (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	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)

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												2370.5949	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	407.4580	337.6740	291.6816	181.2457	91.6795	0.0000	0.0000	0.0000	0.0000	145.8189	274.6247	408.0942	(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)	451.7273	374.3614	323.3720	200.9376	101.6403	0.0000	0.0000	0.0000	0.0000	161.6617	304.4620	452.4326	(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	87.0085	86.8813	86.3990	85.3182	83.1229	76.4000	76.4000	76.4000	76.4000	84.4309	86.2151	87.0879	(216)
Fuel for water heating, kWh/month	119.3302	104.2328	108.7014	98.4947	98.3417	93.9941	90.0431	101.3838	101.9729	105.0853	109.5366	115.5702	(219)
Water heating fuel used												1246.6869	(219)
Annual totals kWh/year													
Space heating fuel - main system												2370.5949	(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												2134.4112	(238)

10a. Fuel costs - using BEDF prices (568)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2370.5949	5.7300	135.8351 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1246.6869	5.7300	71.4352 (247)
Pumps and fans for heating	75.0000	24.1800	18.1350 (249)
Energy for lighting	388.5754	24.1800	93.9575 (250)
Additional standing charges			114.0000 (251)
Energy saving/generation technologies			
PV Unit	-1946.4459	24.1800	-470.6506 (252)
Total energy cost			-37.2878 (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	2370.5949	0.2160	512.0485 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1246.6869	0.2160	269.2844 (264)
Space and water heating			781.3329 (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			11.7231 (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	2370.5949	1.2200	2892.1258 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1246.6869	1.2200	1520.9580 (264)
Space and water heating			4413.0837 (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			-139.3287 (272)
Primary energy kWh/m2/year			-1.6958 (273)

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Built)

Property Reference	078 - PRJ013014			Issued on Date	14/04/2025
Assessment Reference	078	Prop Type Ref	2B		
Property	11 Erwood Close, Netley Abbey, Southampton, SO31 5TJ				
SAP Rating	85 B	DER	14.83	TER	18.29
Environmental	88 B	% DER<TER	18.91		
CO ₂ Emissions (t/year)	1.02	DFEE	44.69	TFEE	50.94
General Requirements Compliance	Pass	% DFEE<TFEE	12.28		
Assessor Details	Mr. Christopher Nicholls, Briary Energy Limited, Tel: 0203 397 1373, chris@briaryenergy.co.uk			Assessor ID	4299-0004
Client					

SUMMARY FOR INPUT DATA FOR New Build (As Built)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	18.29	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.83	kgCO ₂ /m ²	Pass
	-3.46 (-18.9%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	50.94	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	44.69	kWh/m ² /yr	
	-6.2 (-12.2%)	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	3.29 (measured in this dwelling)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Built)

Main heating system

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

Pass

Secondary heating system

None

5 Cylinder insulation

Hot water storage

No cylinder

6 Controls

Space heating controls

Time and temperature zone control

Pass

Hot water controls

No cylinder

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100 %

Minimum

75 %

Pass

8 Mechanical ventilation

Not applicable

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Southern England)

Slight

Pass

Based on:

Overshading

Average

Windows facing East

7.17 m², No overhang

Windows facing West

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

3.29 (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

Air permeability

3.3

m³/m²h

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