

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

Property Reference	002 - PRJ01301 (2)			Issued on Date	30/11/2023
Assessment Reference	002	Prop Type Ref	C-SP		
Property	2 Erwood Close, Netley Abbey, Southampton, SO31 5TJ				
SAP Rating	85 B	DER	14.28	TER	17.14
Environmental	88 B	% DER<TER	16.67		
CO ₂ Emissions (t/year)	1.13	DFEE	43.36	TFEE	48.44
General Requirements Compliance	Pass	% DFEE<TFEE	10.47		
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 95 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) 17.14 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 14.28 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)48.4 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)43.4 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: 4.74 (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

OK

Minimum: 88.0%

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 North East: 3.44 m², No overhang

Windows facing South West: 7.72 m², No overhang

Air change rate: 4.68 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

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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	47.3200 (1b)	x 2.3700 (2b)	= 112.1484 (1b) - (3b)
First floor	47.3200 (1c)	x 2.6300 (2c)	= 124.4516 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.6400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 236.6000 (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					4 * 10 = 40.0000 (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)					40.0000 / (5) = 0.1691 (8)
Pressure test					Yes
Measured/design AP50					4.7400
Infiltration rate					0.4061 (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) =	0.3756 (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	0.4789	0.4695	0.4601	0.4132	0.4038	0.3568	0.3568	0.3474	0.3756	0.4038	0.4226	0.4413 (22b)
Effective ac	0.6147	0.6102	0.6059	0.5854	0.5815	0.5637	0.5637	0.5604	0.5705	0.5815	0.5893	0.5974 (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)			11.1600	1.3258	14.7955		(27)
Flr - Ground			47.3200	0.1800	8.5176	75.6000	3577.3920 (28a)
Wl - Brick (Timber Frame)	82.3680	11.1680	71.2000	0.2100	14.9520	7.4000	526.8800 (29a)
Wl - Clad (Timber Frame)	15.3040	2.0810	13.2230	0.2100	2.7768	7.4000	97.8502 (29a)
Rf - Ins Joist	47.3200		47.3200	0.0800	3.7856	7.4000	350.1680 (30)
Total net area of external elements Aum(A, m ²)			192.3130				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	47.3355		(33)
Party Wall			43.9660	0.0000	0.0000	7.4000	325.3484 (32)
Stud			75.7405			7.4000	560.4794 (32c)
Internal Floor			47.3200			7.4000	350.1680 (32d)
Internal Ceiling			47.3200			7.4000	350.1680 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss
(28)...(30) + (32) + (32a)...(32e) = 6138.4540 (34)
64.8611 (35)
16.3874 (36)
(33) + (36) = 63.7229 (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	47.9924	47.6447	47.3039	45.7033	45.4038	44.0097	44.0097	43.7515	44.5466	45.4038	46.0096	46.6430 (38)
Heat transfer coeff	111.7153	111.3676	111.0268	109.4261	109.1267	107.7325	107.7325	107.4744	108.2695	109.1267	109.7325	110.3659 (39)
Average = Sum(39)m / 12 =												109.4247 (39)
HLP	1.1804	1.1767	1.1731	1.1562	1.1531	1.1383	1.1383	1.1356	1.1440	1.1531	1.1595	1.1662 (40)
HLP (average)												1.1562 (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												2.6841 (42)
Average daily hot water use (litres/day)												97.9464 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	107.7411	103.8232	99.9053	95.9875	92.0696	88.1518	88.1518	92.0696	95.9875	99.9053	103.8232	107.7411 (44)
Energy conte	159.7769	139.7419	144.2011	125.7180	120.6294	104.0940	96.4584	110.6874	112.0094	130.5362	142.4904	154.7354 (45)
Energy content (annual)										Total = Sum(45)m =		1541.0786 (45)

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Distribution loss (46)m = 0.15 x (45)m	23.9665	20.9613	21.6302	18.8577	18.0944	15.6141	14.4688	16.6031	16.8014	19.5804	21.3736	23.2103 (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	0.6708	0.6086	0.6483	0.5430	0.4998	0.4129	0.3826	0.4586	0.4838	0.5869	0.6206	0.6496 (61)
Total heat required for water heating calculated for each month	160.4477	140.3505	144.8494	126.2610	121.1292	104.5070	96.8411	111.1460	112.4932	131.1230	143.1110	155.3850 (62)
WWHRS	-52.6564	-46.3310	-47.2867	-38.9056	-36.1243	-29.8006	-25.2209	-30.5368	-31.4278	-38.8513	-45.0045	-50.8949 eq. (G10)
Total of WWHRS savings												-473.0406
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	107.7913	94.0195	97.5627	87.3555	85.0049	74.7064	71.6202	80.6093	81.0655	92.2717	98.1065	104.4901 (64)
Heat gains from water heating, kWh/month	53.2935	46.6163	48.1089	41.9370	40.2342	34.7145	32.1681	36.9182	37.3641	43.5500	47.5332	51.6119 (65)
Solar input (sum of months) = Sum(63)m =												
Total per year (kWh/year) = Sum(64)m =												

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	134.2030	134.2030	134.2030	134.2030	134.2030	134.2030	134.2030	134.2030	134.2030	134.2030	134.2030	134.2030 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.4194	21.6891	17.6388	13.3537	9.9820	8.4273	9.1059	11.8363	15.8866	20.1717	23.5433	25.0981 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	247.3602	249.9270	243.4587	229.6884	212.3059	195.9688	185.0546	182.4878	188.9561	202.7264	220.1089	236.4460 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.4203	36.4203	36.4203	36.4203	36.4203	36.4203	36.4203	36.4203	36.4203	36.4203	36.4203	36.4203 (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)	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624 (71)
Water heating gains (Table 5)	71.6311	69.3695	64.6626	58.2458	54.0783	48.2146	43.2367	49.6213	51.8946	58.5349	66.0183	69.3709 (72)
Total internal gains	409.6715	407.2465	392.0209	367.5488	342.6271	318.8715	303.6581	310.2062	322.9981	347.6939	375.9314	397.1758 (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
Northeast				3.4430	11.2829	0.7300		0.7200		0.7700		14.1497 (75)
Southwest				7.7170	36.7938	0.7300		0.7200		0.7700		103.4218 (79)
Solar gains	117.5715	204.9678	292.9298	383.8792	449.0761	454.2298	434.4298	384.5056	324.2242	229.8991	141.6795	100.0629 (83)
Total gains	527.2431	612.2143	684.9507	751.4280	791.7032	773.1013	738.0879	694.7118	647.2224	577.5929	517.6109	497.2387 (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	15.2631	15.3108	15.3578	15.5824	15.6252	15.8274	15.8274	15.8654	15.7489	15.6252	15.5389	15.4498
alpha	2.0175	2.0207	2.0239	2.0388	2.0417	2.0552	2.0552	2.0577	2.0499	2.0417	2.0359	2.0300
util living area	0.9427	0.9219	0.8898	0.8341	0.7502	0.6335	0.5175	0.5540	0.7190	0.8582	0.9240	0.9484 (86)
MIT	17.7682	18.0940	18.6300	19.3356	19.9938	20.5195	20.7785	20.7363	20.3239	19.4720	18.5044	17.7145 (87)
Th 2	19.9357	19.9386	19.9415	19.9552	19.9577	19.9696	19.9696	19.9719	19.9650	19.9577	19.9526	19.9472 (88)
util rest of house	0.9360	0.9128	0.8764	0.8124	0.7136	0.5717	0.4262	0.4654	0.6657	0.8352	0.9136	0.9424 (89)
MIT 2	15.6427	16.1089	16.8747	17.8776	18.7904	19.4921	19.8002	19.7598	19.2530	18.0870	16.7079	15.5683 (90)
Living area fraction	16.0057	16.4479	17.1744	18.1265	18.9959	19.6675	19.9672	19.9265	19.4359	18.3235	17.0147	0.1708 (91)
MIT	16.0057	16.4479	17.1744	18.1265	18.9959	19.6675	19.9672	19.9265	19.4359	18.3235	17.0147	15.9348 (92)
Temperature adjustment												-0.1500
adjusted MIT	15.8557	16.2979	17.0244	17.9765	18.8459	19.5175	19.8172	19.7765	19.2859	18.1735	16.8647	15.7848 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	472.3447	530.5716	564.9188	570.2294	527.3860	417.8063	303.4275	310.0838	403.4407	451.4974	449.2791	449.8546 (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	1290.9446	1269.3543	1168.4946	993.2105	779.8097	529.7775	346.5994	362.8890	561.4719	826.4666	1071.5037	1278.5619 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	609.0383	496.4620	449.0604	304.5464	187.8032	0.0000	0.0000	0.0000	0.0000	278.9771	448.0017	616.5582 (98)
Space heating												3390.4474 (98)
Space heating per m ²												35.8247 (99)

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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 %)

90.2000 (206)

Efficiency of secondary/supplementary heating system, %

0.0000 (208)

Space heating requirement

3758.8108 (211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	609.0383	496.4620	449.0604	304.5464	187.8032	0.0000	0.0000	0.0000	0.0000	278.9771	448.0017	616.5582	(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)	675.2088	550.4013	497.8496	337.6346	208.2076	0.0000	0.0000	0.0000	0.0000	309.2873	496.6760	683.5457	(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	107.7913	94.0195	97.5627	87.3555	85.0049	74.7064	71.6202	80.6093	81.0655	92.2717	98.1065	104.4901	(64)
Efficiency of water heater (217)m	87.8148	87.6783	87.3829	86.7089	85.3938	76.4000	76.4000	76.4000	76.4000	86.3245	87.3651	87.8992	(216)
Fuel for water heating, kWh/month	122.7484	107.2323	111.6497	100.7457	99.5445	97.7832	93.7437	105.5095	106.1066	106.8893	112.2949	118.8749	(219)
Water heating fuel used												1283.1228	(219)
Annual totals kWh/year													
Space heating fuel - main system												3758.8108	(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)												431.2545	(232)
Total delivered energy for all uses												5548.1882	(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	3758.8108	0.2160	811.9031	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1283.1228	0.2160	277.1545	(264)
Space and water heating			1089.0577	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	431.2545	0.5190	223.8211	(268)
Total CO2, kg/year			1351.8038	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			14.2800	(273)

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

DER		14.2800	ZC1
Total Floor Area	TFA	94.6400	
Assumed number of occupants	N	2.6841	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		15.4882	ZC2
CO2 emissions from cooking, equation (L16)		1.9381	ZC3
Total CO2 emissions		31.7063	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		31.7063	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	47.3200 (1b)	x 2.3700 (2b)	= 112.1484 (1b) - (3b)
First floor	47.3200 (1c)	x 2.6300 (2c)	= 124.4516 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.6400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 236.6000 (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) = 0.1268 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3768 (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) =	0.3485 (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	0.4444	0.4357	0.4270	0.3834	0.3747	0.3311	0.3311	0.3224	0.3485	0.3747	0.3921	0.4095 (22b)
Effective ac	0.5987	0.5949	0.5911	0.5735	0.5702	0.5548	0.5548	0.5520	0.5607	0.5702	0.5769	0.5839 (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)			11.1600	1.3258	14.7955		(27)
Floor - Ground			47.3200	0.1300	6.1516		(28a)
W1 - Brick (Timber Frame)	82.3680	11.1680	71.2000	0.1800	12.8160		(29a)
W1 - Clad (Timber Frame)	15.3040	2.0810	13.2230	0.1800	2.3801		(29a)
Rf - Ins Joist	47.3200		47.3200	0.1300	6.1516		(30)
Total net area of external elements Aum(A, m ²)			192.3130				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		44.3848		(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)							9.4460 (36)
Total fabric heat loss						(33) + (36) =	53.8308 (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	46.7483	46.4490	46.1555	44.7773	44.5194	43.3190	43.3190	43.0967	43.7814	44.5194	45.0411	45.5864 (38)
Heat transfer coeff	100.5791	100.2797	99.9863	98.6081	98.3502	97.1498	97.1498	96.9275	97.6122	98.3502	98.8719	99.4172 (39)
Average = Sum(39)m / 12 =												98.6068 (39)
HLP	1.0628	1.0596	1.0565	1.0419	1.0392	1.0265	1.0265	1.0242	1.0314	1.0392	1.0447	1.0505 (40)
HLP (average)												1.0419 (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												2.6841 (42)
Average daily hot water use (litres/day)												97.9464 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	107.7411	103.8232	99.9053	95.9875	92.0696	88.1518	88.1518	92.0696	95.9875	99.9053	103.8232	107.7411 (44)
Energy content (annual)	159.7769	139.7419	144.2011	125.7180	120.6294	104.0940	96.4584	110.6874	112.0094	130.5362	142.4904	154.7354 (45)
Distribution loss (46)m = 0.15 x (45)m	23.9665	20.9613	21.6302	18.8577	18.0944	15.6141	14.4688	16.6031	16.8014	19.5804	21.3736	23.2103 (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)

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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	0.0000 (57)
Combi loss	50.9589	46.0274	50.9107	47.3363	46.9177	43.4721	44.9212	46.9177	47.3363	50.9107	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	210.7358	185.7693	195.1118	173.0543	167.5471	147.5661	141.3796	157.6051	159.3457	181.4468	191.8055	205.6943	(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	210.7358	185.7693	195.1118	173.0543	167.5471	147.5661	141.3796	157.6051	159.3457	181.4468	191.8055	205.6943	(64)
Heat gains from water heating, kWh/month	65.8655	57.9710	60.6745	53.6353	51.8387	45.4793	43.3027	48.5330	49.0772	56.1309	59.7068	64.1892	(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	134.2030	134.2030	134.2030	134.2030	134.2030	134.2030	134.2030	134.2030	134.2030	134.2030	134.2030	134.2030	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.5721	21.8247	17.7491	13.4372	10.0445	8.4800	9.1629	11.9103	15.9859	20.2978	23.6905	25.2550	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	247.3602	249.9270	243.4587	229.6884	212.3059	195.9688	185.0546	182.4878	188.9561	202.7264	220.1089	236.4460	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.4203	36.4203	36.4203	36.4203	36.4203	36.4203	36.4203	36.4203	36.4203	36.4203	36.4203	36.4203	(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)	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624	(71)
Water heating gains (Table 5)	88.5290	86.2664	81.5518	74.4935	69.6757	63.1657	58.2026	65.2325	68.1628	75.4448	82.9262	86.2759	(72)
Total internal gains	426.7221	424.2790	409.0204	383.8800	358.2869	333.8753	318.6810	325.8915	339.3657	364.7299	392.9865	414.2378	(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
Northeast			3.4430		11.2829		0.6300		0.7000		0.7700		11.8722 (75)
Southwest			7.7170		36.7938		0.6300		0.7000		0.7700		86.7751 (79)
Solar gains	98.6473	171.9764	245.7801	322.0905	376.7933	381.1175	364.5045	322.6160	272.0375	192.8948	118.8749		83.9569 (83)
Total gains	525.3695	596.2554	654.8006	705.9704	735.0802	714.9928	683.1854	648.5075	611.4032	557.6246	511.8614		498.1947 (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	65.3438	65.5389	65.7312	66.6499	66.8247	67.6504	67.6504	67.8056	67.3300	66.8247	66.4721	66.1075	
alpha	5.3563	5.3693	5.3821	5.4433	5.4550	5.5100	5.5100	5.5204	5.4887	5.4550	5.4315	5.4072	
util living area	0.9986	0.9970	0.9923	0.9757	0.9212	0.7817	0.6071	0.6578	0.8837	0.9830	0.9971	0.9990	(86)
MIT	19.8353	19.9708	20.1924	20.4895	20.7594	20.9362	20.9871	20.9804	20.8649	20.5193	20.1259	19.8150	(87)
Th 2	20.0314	20.0340	20.0365	20.0485	20.0508	20.0613	20.0613	20.0632	20.0572	20.0508	20.0462	20.0415	(88)
util rest of house	0.9982	0.9960	0.9895	0.9659	0.8879	0.6989	0.4871	0.5384	0.8239	0.9744	0.9959	0.9986	(89)
MIT 2	18.4690	18.6688	18.9933	19.4297	19.8006	20.0154	20.0561	20.0545	19.9417	19.4780	18.9048	18.4466	(90)
Living area fraction	18.7023	18.8911	19.1981	19.6106	19.9643	20.1726	20.2151	20.2126	20.0994	19.6558	19.1133	18.6803	(91)
MIT	18.7023	18.8911	19.1981	19.6106	19.9643	20.1726	20.2151	20.2126	20.0994	19.6558	19.1133	18.6803	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7023	18.8911	19.1981	19.6106	19.9643	20.1726	20.2151	20.2126	20.0994	19.6558	19.1133	18.6803	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	523.9032	592.7753	645.6834	677.7366	649.9703	507.4381	346.7844	362.2290	505.6818	540.5855	508.8373	497.1437	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1448.5738	1403.0284	1269.6321	1056.1539	812.8003	541.3785	351.2064	369.5437	585.6104	890.6406	1187.7770	1439.5896	(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	687.9549	544.4901	464.2178	272.4605	121.1455	0.0000	0.0000	0.0000	0.0000	260.4410	488.8366	701.1797	(98)
Space heating												3540.7262	(98)
Space heating per m2												37.4126	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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 %)												93.4000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												3790.9274 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	687.9549	544.4901	464.2178	272.4605	121.1455	0.0000	0.0000	0.0000	0.0000	260.4410	488.8366	701.1797 (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)	736.5684	582.9658	497.0212	291.7136	129.7061	0.0000	0.0000	0.0000	0.0000	278.8447	523.3797	750.7278 (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	210.7358	185.7693	195.1118	173.0543	167.5471	147.5661	141.3796	157.6051	159.3457	181.4468	191.8055	205.6943 (64)
Efficiency of water heater (217)m	87.8101	87.5972	87.1560	86.1891	84.2500	80.3000	80.3000	80.3000	80.3000	85.9604	87.3055	80.3000 (216)
Fuel for water heating, kWh/month	239.9903	212.0722	223.8651	200.7845	198.8690	183.7685	176.0643	196.2704	198.4380	211.0818	219.6946	234.0293 (219)
Water heating fuel used												2494.9280 (219)
Annual totals kWh/year												3790.9274 (211)
Space heating fuel - main system												0.0000 (215)
Space heating fuel - secondary												
Electricity for pumps and fans:												
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												75.0000 (231)
Electricity for lighting (calculated in Appendix L)												433.9512 (232)
Total delivered energy for all uses												6794.8066 (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	3790.9274	0.2160	818.8403 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2494.9280	0.2160	538.9044 (264)
Space and water heating			1357.7448 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	433.9512	0.5190	225.2207 (268)
Total CO2, kg/m2/year			1621.8904 (272)
Emissions per m2 for space and water heating			14.3464 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3798 (272b)
Emissions per m2 for pumps and fans			0.4113 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.3464 * 1.00) + 2.3798 + 0.4113, rounded to 2 d.p.			17.1400 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	47.3200 (1b)	x 2.3700 (2b)	= 112.1484 (1b) - (3b)
First floor	47.3200 (1c)	x 2.6300 (2c)	= 124.4516 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.6400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 236.6000 (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) = 0.1268 (8)
Pressure test					Yes
Measured/design AP50					4.7400
Infiltration rate					0.3638 (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) = 0.3365 (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	0.4291	0.4206	0.4122	0.3702	0.3617	0.3197	0.3197	0.3113	0.3365	0.3617	0.3786	0.3954 (22b)
Effective ac	0.5920	0.5885	0.5850	0.5685	0.5654	0.5511	0.5511	0.5484	0.5566	0.5654	0.5717	0.5782 (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)			11.1600	1.3258	14.7955		(27)
Flr - Ground			47.3200	0.1800	8.5176	75.6000	3577.3920 (28a)
Wl - Brick (Timber Frame)	82.3680	11.1680	71.2000	0.2100	14.9520	7.4000	526.8800 (29a)
Wl - Clad (Timber Frame)	15.3040	2.0810	13.2230	0.2100	2.7768	7.4000	97.8502 (29a)
Rf - Ins Joist	47.3200		47.3200	0.0800	3.7856	7.4000	350.1680 (30)
Total net area of external elements Aum(A, m ²)			192.3130				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	47.3355		(33)
Party Wall			43.9660	0.0000	0.0000	7.4000	325.3484 (32)
Stud			75.7405			7.4000	560.4794 (32c)
Internal Floor			47.3200			7.4000	350.1680 (32d)
Internal Ceiling			47.3200			7.4000	350.1680 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss
(28)...(30) + (32) + (32a)...(32e) = 6138.4540 (34)
64.8611 (35)
16.3874 (36)
(33) + (36) = 63.7229 (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	46.2255	45.9465	45.6729	44.3881	44.1478	43.0288	43.0288	42.8215	43.4598	44.1478	44.6340	45.1424 (38)
Heat transfer coeff	109.9484	109.6693	109.3958	108.1110	107.8706	106.7516	106.7516	106.5444	107.1827	107.8706	108.3569	108.8653 (39)
Average = Sum(39)m / 12 =												108.1099 (39)
HLP	1.1618	1.1588	1.1559	1.1423	1.1398	1.1280	1.1280	1.1258	1.1325	1.1398	1.1449	1.1503 (40)
HLP (average)												1.1423 (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												2.6841 (42)
Average daily hot water use (litres/day)												97.9464 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	107.7411	103.8232	99.9053	95.9875	92.0696	88.1518	88.1518	92.0696	95.9875	99.9053	103.8232	107.7411 (44)
Energy conte	159.7769	139.7419	144.2011	125.7180	120.6294	104.0940	96.4584	110.6874	112.0094	130.5362	142.4904	154.7354 (45)
Energy content (annual)										Total = Sum(45)m =		1541.0786 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (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)
Primary 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 (59)
Heat gains from water heating, kWh/month	33.9526	29.6952	30.6427	26.7151	25.6338	22.1200	20.4974	23.5211	23.8020	27.7389	30.2792	32.8813 (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	134.2030	134.2030	134.2030	134.2030	134.2030	134.2030	134.2030	134.2030	134.2030	134.2030	134.2030	134.2030	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.4194	21.6891	17.6388	13.3537	9.9820	8.4273	9.1059	11.8363	15.8866	20.1717	23.5433	25.0981	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	247.3602	249.9270	243.4587	229.6884	212.3059	195.9688	185.0546	182.4878	188.9561	202.7264	220.1089	236.4460	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.4203	36.4203	36.4203	36.4203	36.4203	36.4203	36.4203	36.4203	36.4203	36.4203	36.4203	36.4203	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624	(71)
Water heating gains (Table 5)	45.6352	44.1892	41.1865	37.1043	34.4540	30.7222	27.5503	31.6144	33.0583	37.2835	42.0545	44.1953	(72)
Total internal gains	380.6757	379.0662	365.5448	343.4072	320.0028	298.3791	284.9717	289.1993	301.1619	323.4425	348.9676	369.0002	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g		FF		Access factor Table 6d		Gains W
						Specific data or Table 6b		Specific data or Table 6c				
Northeast				3.4430	11.2829	0.7300		0.7200		0.7700		14.1497 (75)
Southwest				7.7170	36.7938	0.7300		0.7200		0.7700		103.4218 (79)
Solar gains	117.5715	204.9678	292.9298	383.8792	449.0761	454.2298	434.4298	384.5056	324.2242	229.8991	141.6795	100.0629 (83)
Total gains	498.2472	584.0340	658.4746	727.2865	769.0789	752.6090	719.4016	673.7049	625.3861	553.3415	490.6471	469.0631 (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	15.5084	15.5479	15.5868	15.7720	15.8071	15.9728	15.9728	16.0039	15.9086	15.8071	15.7362	15.6627	
alpha	2.0339	2.0365	2.0391	2.0515	2.0538	2.0649	2.0649	2.0669	2.0606	2.0538	2.0491	2.0442	
util living area	0.9477	0.9271	0.8954	0.8402	0.7567	0.6406	0.5241	0.5626	0.7278	0.8658	0.9300	0.9532	(86)
MIT	17.7523	18.0813	18.6207	19.3258	19.9872	20.5140	20.7759	20.7313	20.3139	19.4545	18.4814	17.6930	(87)
Th 2	19.9507	19.9531	19.9554	19.9664	19.9685	19.9781	19.9781	19.9798	19.9744	19.9685	19.9643	19.9600	(88)
util rest of house	0.9415	0.9187	0.8827	0.8192	0.7209	0.5794	0.4330	0.4743	0.6755	0.8439	0.9204	0.9477	(89)
MIT 2	16.9704	17.2963	17.8289	18.5239	19.1570	19.6443	19.8593	19.8302	19.4746	18.6613	17.7037	16.9177	(90)
Living area fraction									fLA = Living area / (4) =			0.1708	(91)
MIT	17.1039	17.4303	17.9641	18.6608	19.2987	19.7928	20.0158	19.9840	19.6180	18.7968	17.8365	17.0501	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.1039	17.4303	17.9641	18.6608	19.2987	19.7928	20.0158	19.9840	19.6180	18.7968	17.8365	17.0501	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	457.5785	520.5169	560.5895	572.1214	533.5201	426.6425	314.1450	319.8205	409.1871	449.4374	438.5284	434.4176	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1407.7726	1374.1949	1254.1285	1055.2491	819.6805	554.3387	364.6443	381.8585	591.4288	884.1889	1163.3727	1398.9307	(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	706.9444	573.6716	515.9931	347.8519	212.9033	0.0000	0.0000	0.0000	0.0000	323.4551	521.8879	717.5977	(98)
Space heating												3920.3050	(98)
Space heating per m2										(98) / (4) =		41.4233	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1003.4654	789.9621	809.7375	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6666	0.7308	0.7054	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	668.9501	577.2918	571.1688	0.0000	0.0000	0.0000	0.0000	(102)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	982.6686	941.7608	890.4666	0.0000	0.0000	0.0000	0.0000 (103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	225.8774	271.1649	237.5576	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												734.5999 (104)
Cooled fraction									fC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	56.4693	67.7912	59.3894	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												183.6500 (107)
Space cooling per m2												1.9405 (108)
Energy for space heating												41.4233 (99)
Energy for space cooling												1.9405 (108)
Total												43.3639 (109)
Dwelling Fabric Energy Efficiency (DFEE)												43.4 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	47.3200 (1b)	x 2.3700 (2b)	= 112.1484 (1b) - (3b)
First floor	47.3200 (1c)	x 2.6300 (2c)	= 124.4516 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.6400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 236.6000 (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) = 0.1268 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3768 (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) =	0.3485 (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	0.4444	0.4357	0.4270	0.3834	0.3747	0.3311	0.3311	0.3224	0.3485	0.3747	0.3921	0.4095 (22b)
Effective ac	0.5987	0.5949	0.5911	0.5735	0.5702	0.5548	0.5548	0.5520	0.5607	0.5702	0.5769	0.5839 (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)			11.1600	1.3258	14.7955		(27)
Flr - Ground			47.3200	0.1300	6.1516		(28a)
Wl - Brick (Timber Frame)	82.3680	11.1680	71.2000	0.1800	12.8160		(29a)
Wl - Clad (Timber Frame)	15.3040	2.0810	13.2230	0.1800	2.3801		(29a)
Rf - Ins Joist	47.3200		47.3200	0.1300	6.1516		(30)
Total net area of external elements Aum(A, m ²)			192.3130				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.3848		(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)							9.4460 (36)
Total fabric heat loss						(33) + (36) =	53.8308 (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	46.7483	46.4490	46.1555	44.7773	44.5194	43.3190	43.3190	43.0967	43.7814	44.5194	45.0411	45.5864 (38)
Heat transfer coeff	100.5791	100.2797	99.9863	98.6081	98.3502	97.1498	97.1498	96.9275	97.6122	98.3502	98.8719	99.4172 (39)
Average = Sum(39)m / 12 =												98.6068 (39)
HLP	1.0628	1.0596	1.0565	1.0419	1.0392	1.0265	1.0265	1.0242	1.0314	1.0392	1.0447	1.0505 (40)
HLP (average)												1.0419 (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												2.6841 (42)
Average daily hot water use (litres/day)												97.9464 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	107.7411	103.8232	99.9053	95.9875	92.0696	88.1518	88.1518	92.0696	95.9875	99.9053	103.8232	107.7411 (44)
Energy content (annual)	159.7769	139.7419	144.2011	125.7180	120.6294	104.0940	96.4584	110.6874	112.0094	130.5362	142.4904	154.7354 (45)
Distribution loss (46)m = 0.15 x (45)m												1541.0786 (45)
Water 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 (46)
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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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)
Primary 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 (59)
Heat gains from water heating, kWh/month	33.9526	29.6952	30.6427	26.7151	25.6338	22.1200	20.4974	23.5211	23.8020	27.7389	30.2792	32.8813 (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	134.2030	134.2030	134.2030	134.2030	134.2030	134.2030	134.2030	134.2030	134.2030	134.2030	134.2030	134.2030	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.5721	21.8247	17.7491	13.4372	10.0445	8.4800	9.1629	11.9103	15.9859	20.2978	23.6905	25.2550	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	247.3602	249.9270	243.4587	229.6884	212.3059	195.9688	185.0546	182.4878	188.9561	202.7264	220.1089	236.4460	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.4203	36.4203	36.4203	36.4203	36.4203	36.4203	36.4203	36.4203	36.4203	36.4203	36.4203	36.4203	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624	(71)
Water heating gains (Table 5)	45.6352	44.1892	41.1865	37.1043	34.4540	30.7222	27.5503	31.6144	33.0583	37.2835	42.0545	44.1953	(72)
Total internal gains	380.8284	379.2018	365.6551	343.4907	320.0652	298.4318	285.0287	289.2733	301.2613	323.5686	349.1148	369.1572	(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
Northeast				3.4430	11.2829	0.6300		0.7000		0.7700		11.8722 (75)
Southwest				7.7170	36.7938	0.6300		0.7000		0.7700		86.7751 (79)

Solar gains	98.6473	171.9764	245.7801	322.0905	376.7933	381.1175	364.5045	322.6160	272.0375	192.8948	118.8749	83.9569 (83)
Total gains	479.4757	551.1782	611.4352	665.5812	696.8585	679.5493	649.5332	611.8893	573.2987	516.4633	467.9897	453.1140 (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	65.3438	65.5389	65.7312	66.6499	66.8247	67.6504	67.6504	67.8056	67.3300	66.8247	66.4721	66.1075	
alpha	5.3563	5.3693	5.3821	5.4433	5.4550	5.5100	5.5100	5.5204	5.4887	5.4550	5.4315	5.4072	
util living area	0.9991	0.9979	0.9944	0.9811	0.9347	0.8064	0.6341	0.6892	0.9052	0.9879	0.9981	0.9994	(86)
MIT	19.7893	19.9260	20.1502	20.4532	20.7333	20.9251	20.9842	20.9755	20.8432	20.4808	20.0821	19.7696	(87)
Th 2	20.0314	20.0340	20.0365	20.0485	20.0508	20.0613	20.0613	20.0632	20.0572	20.0508	20.0462	20.0415	(88)
util rest of house	0.9988	0.9972	0.9923	0.9733	0.9054	0.7261	0.5110	0.5679	0.8518	0.9816	0.9973	0.9992	(89)
MIT 2	18.9188	19.0573	19.2827	19.5914	19.8580	20.0236	20.0569	20.0555	19.9628	19.6228	19.2234	18.9073	(90)
Living area fraction									fLA = Living area / (4) =			0.1708	(91)
MIT	19.0674	19.2056	19.4308	19.7386	20.0075	20.1775	20.2152	20.2126	20.1131	19.7694	19.3700	19.0546	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0674	19.2056	19.4308	19.7386	20.0075	20.1775	20.2152	20.2126	20.1131	19.7694	19.3700	19.0546	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	478.7143	549.1776	605.6602	645.5708	629.8210	500.9587	345.6650	360.1495	490.5501	505.6161	466.3581	452.5859	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(95)
Heat loss rate W	1485.2963	1434.5661	1292.9040	1068.7724	817.0413	541.8535	351.2155	369.5459	586.9528	901.8075	1213.1599	1476.7994	(96)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	748.8970	594.9811	511.3094	304.7052	139.2918	0.0000	0.0000	0.0000	0.0000	294.7664	537.6973	762.0149	(98)
Space heating												3893.6631	(98)
Space heating per m2												41.1418	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	913.2080	718.9084	736.6489	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8389	0.9113	0.8874	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	766.0702	655.1382	653.7229	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	897.3444	860.1722	818.3131	0.0000	0.0000	0.0000	0.0000	(103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	94.5174	152.5453	122.4551	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												369.5178	(104)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Cooled fraction											FC = cooled area / (4) =	1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	23.6294	38.1363	30.6138	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												92.3795 (107)
Space cooling per m2												0.9761 (108)
Energy for space heating												41.1418 (99)
Energy for space cooling												0.9761 (108)
Total												42.1179 (109)
Target Fabric Energy Efficiency (TFEE)												48.4 (109)

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	47.3200 (1b)	x 2.3700 (2b)	= 112.1484 (1b) - (3b)
First floor	47.3200 (1c)	x 2.6300 (2c)	= 124.4516 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.6400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 236.6000 (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					4 * 10 = 40.0000 (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)					40.0000 / (5) = 0.1691 (8)
Pressure test					Yes
Measured/design AP50					4.7400
Infiltration rate					0.4061 (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) =	0.3756 (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	0.4601	0.4319	0.4226	0.3944	0.3944	0.3850	0.3850	0.3756	0.3756	0.4038	0.4038	0.4132 (22b)
Effective ac	0.6059	0.5933	0.5893	0.5778	0.5778	0.5741	0.5741	0.5705	0.5705	0.5815	0.5815	0.5854 (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)			11.1600	1.3258	14.7955		(27)
Flr - Ground			47.3200	0.1800	8.5176	75.6000	3577.3920 (28a)
Wl - Brick (Timber Frame)	82.3680	11.1680	71.2000	0.2100	14.9520	7.4000	526.8800 (29a)
Wl - Clad (Timber Frame)	15.3040	2.0810	13.2230	0.2100	2.7768	7.4000	97.8502 (29a)
Rf - Ins Joist	47.3200		47.3200	0.0800	3.7856	7.4000	350.1680 (30)
Total net area of external elements Aum(A, m ²)			192.3130				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		47.3355		(33)
Party Wall			43.9660	0.0000	0.0000	7.4000	325.3484 (32)
Stud			75.7405			7.4000	560.4794 (32c)
Internal Floor			47.3200			7.4000	350.1680 (32d)
Internal Ceiling			47.3200			7.4000	350.1680 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss
(28)...(30) + (32) + (32a)...(32e) = 6138.4540 (34)
64.8611 (35)
16.3874 (36)
(33) + (36) = 63.7229 (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	47.3039	46.3229	46.0096	45.1112	45.1112	44.8255	44.8255	44.5466	44.5466	45.4038	45.4038	45.7033 (38)
Heat transfer coeff	111.0268	110.0457	109.7325	108.8341	108.8341	108.5484	108.5484	108.2695	108.2695	109.1267	109.1267	109.4261 (39)
Average = Sum(39)m / 12 =												109.1490 (39)
HLP	1.1731	1.1628	1.1595	1.1500	1.1500	1.1470	1.1470	1.1440	1.1440	1.1531	1.1531	1.1562 (40)
HLP (average)												1.1533 (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												2.6841 (42)
Average daily hot water use (litres/day)												97.9464 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	107.7411	103.8232	99.9053	95.9875	92.0696	88.1518	88.1518	92.0696	95.9875	99.9053	103.8232	107.7411 (44)
Energy conte	159.7769	139.7419	144.2011	125.7180	120.6294	104.0940	96.4584	110.6874	112.0094	130.5362	142.4904	154.7354 (45)
Energy content (annual)										Total = Sum(45)m =		1541.0786 (45)

Distribution loss (46)m = 0.15 x (45)m												
23.9665	20.9613	21.6302	18.8577	18.0944	15.6141	14.4688	16.6031	16.8014	19.5804	21.3736	23.2103	(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	0.6708	0.6086	0.6483	0.5430	0.4998	0.4129	0.3826	0.4586	0.4838	0.5869	0.6206	0.6496 (61)
Total heat required for water heating calculated for each month												
160.4477	140.3505	144.8494	126.2610	121.1292	104.5070	96.8411	111.1460	112.4932	131.1230	143.1110	155.3850	(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	(63)
							Solar input (sum of months) = Sum(63)m =				0.0000	(63)
Output from w/h												
160.4477	140.3505	144.8494	126.2610	121.1292	104.5070	96.8411	111.1460	112.4932	131.1230	143.1110	155.3850	(64)
							Total per year (kWh/year) = Sum(64)m =				1547.6441	(64)
											1548	(64)
RHI water heating demand												
Heat gains from water heating, kWh/month												
53.2935	46.6163	48.1089	41.9370	40.2342	34.7145	32.1681	36.9182	37.3641	43.5500	47.5332	51.6119	(65)

[illegible]

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	47.3200 (1b)	x 2.3700 (2b)	= 112.1484 (1b) - (3b)
First floor	47.3200 (1c)	x 2.6300 (2c)	= 124.4516 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.6400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 236.6000 (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					4 * 10 = 40.0000 (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) =					40.0000 / (5) = 0.1691 (8)
Pressure test					Yes
Measured/design AP50					4.7400
Infiltration rate					0.4061 (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) =	0.3756 (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	0.4789	0.4695	0.4601	0.4132	0.4038	0.3568	0.3568	0.3474	0.3756	0.4038	0.4226	0.4413 (22b)
Effective ac	0.6147	0.6102	0.6059	0.5854	0.5815	0.5637	0.5637	0.5604	0.5705	0.5815	0.5893	0.5974 (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)			11.1600	1.3258	14.7955		(27)
Flr - Ground			47.3200	0.1800	8.5176	75.6000	3577.3920 (28a)
Wl - Brick (Timber Frame)	82.3680	11.1680	71.2000	0.2100	14.9520	7.4000	526.8800 (29a)
Wl - Clad (Timber Frame)	15.3040	2.0810	13.2230	0.2100	2.7768	7.4000	97.8502 (29a)
Rf - Ins Joist	47.3200		47.3200	0.0800	3.7856	7.4000	350.1680 (30)
Total net area of external elements Aum(A, m ²)			192.3130				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	47.3355		(33)
Party Wall			43.9660	0.0000	0.0000	7.4000	325.3484 (32)
Stud			75.7405			7.4000	560.4794 (32c)
Internal Floor			47.3200			7.4000	350.1680 (32d)
Internal Ceiling			47.3200			7.4000	350.1680 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss
(28)...(30) + (32) + (32a)...(32e) = 6138.4540 (34)
64.8611 (35)
16.3874 (36)
(33) + (36) = 63.7229 (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	47.9924	47.6447	47.3039	45.7033	45.4038	44.0097	44.0097	43.7515	44.5466	45.4038	46.0096	46.6430 (38)
Heat transfer coeff	111.7153	111.3676	111.0268	109.4261	109.1267	107.7325	107.7325	107.4744	108.2695	109.1267	109.7325	110.3659 (39)
Average = Sum(39)m / 12 =												109.4247 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1804	1.1767	1.1731	1.1562	1.1531	1.1383	1.1383	1.1356	1.1440	1.1531	1.1595	1.1662 (40)
HLP (average)												1.1562 (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												2.6841 (42)
Average daily hot water use (litres/day)												97.9464 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	107.7411	103.8232	99.9053	95.9875	92.0696	88.1518	88.1518	92.0696	95.9875	99.9053	103.8232	107.7411 (44)
Energy conte	159.7769	139.7419	144.2011	125.7180	120.6294	104.0940	96.4584	110.6874	112.0094	130.5362	142.4904	154.7354 (45)
Energy content (annual)										Total = Sum(45)m =		1541.0786 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	23.9665	20.9613	21.6302	18.8577	18.0944	15.6141	14.4688	16.6031	16.8014	19.5804	21.3736	23.2103 (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	0.6708	0.6086	0.6483	0.5430	0.4998	0.4129	0.3826	0.4586	0.4838	0.5869	0.6206	0.6496 (61)
Total heat required for water heating calculated for each month	160.4477	140.3505	144.8494	126.2610	121.1292	104.5070	96.8411	111.1460	112.4932	131.1230	143.1110	155.3850 (62)
WWHRS	-52.6564	-46.3310	-47.2867	-38.9056	-36.1243	-29.8006	-25.2209	-30.5368	-31.4278	-38.8513	-45.0045	-50.8949 eq. (G10)
Total of WWHRS savings												-473.0406
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	107.7913	94.0195	97.5627	87.3555	85.0049	74.7064	71.6202	80.6093	81.0655	92.2717	98.1065	104.4901 (64)
Heat gains from water heating, kWh/month	53.2935	46.6163	48.1089	41.9370	40.2342	34.7145	32.1681	36.9182	37.3641	43.5500	47.5332	51.6119 (65)
Total per year (kWh/year) = Sum(64)m = 1074.6035 (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	161.0436	161.0436	161.0436	161.0436	161.0436	161.0436	161.0436	161.0436	161.0436	161.0436	161.0436	161.0436 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	61.0485	54.2228	44.0969	33.3842	24.9551	21.0681	22.7649	29.5906	39.7165	50.4292	58.8583	62.7453 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	369.1943	373.0253	363.3711	342.8185	316.8745	292.4907	276.2009	272.3698	282.0240	302.5767	328.5207	352.9044 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.7884	53.7884	53.7884	53.7884	53.7884	53.7884	53.7884	53.7884	53.7884	53.7884	53.7884	53.7884 (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)	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624 (71)
Water heating gains (Table 5)	71.6311	69.3695	64.6626	58.2458	54.0783	48.2146	43.2367	49.6213	51.8946	58.5349	66.0183	69.3709 (72)
Total internal gains	612.3435	607.0873	582.6002	544.9181	506.3774	472.2431	452.6720	462.0513	484.1047	522.0104	563.8670	595.4902 (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
Northeast				3.4430	11.2829	0.7300		0.7200		0.7700		14.1497 (75)
Southwest				7.7170	36.7938	0.7300		0.7200		0.7700		103.4218 (79)

Solar gains	117.5715	204.9678	292.9298	383.8792	449.0761	454.2298	434.4298	384.5056	324.2242	229.8991	141.6795	100.0629 (83)
Total gains	729.9150	812.0550	875.5300	928.7974	955.4535	926.4729	887.1019	846.5570	808.3289	751.9095	705.5465	695.5531 (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	15.2631	15.3108	15.3578	15.5824	15.6252	15.8274	15.8274	15.8654	15.7489	15.6252	15.5389	15.4498
alpha	2.0175	2.0207	2.0239	2.0388	2.0417	2.0552	2.0552	2.0577	2.0499	2.0417	2.0359	2.0300
util living area	0.9026	0.8785	0.8420	0.7803	0.6913	0.5697	0.4539	0.4844	0.6453	0.7961	0.8762	0.9100 (86)
MIT	18.1503	18.4465	18.9325	19.5695	20.1529	20.6111	20.8282	20.7970	20.4589	19.7180	18.8380	18.0980 (87)
Th 2	19.9357	19.9386	19.9415	19.9552	19.9577	19.9696	19.9696	19.9719	19.9650	19.9577	19.9526	19.9472 (88)
util rest of house	0.8921	0.8656	0.8246	0.7546	0.6514	0.5076	0.3690	0.4000	0.5884	0.7670	0.8610	0.9003 (89)
MIT 2	16.1829	16.6034	17.2929	18.1910	18.9899	19.5912	19.8417	19.8134	19.4093	18.4146	17.1738	16.1120 (90)
Living area fraction									fLA = Living area / (4) =			0.1708 (91)
MIT	16.5188	16.9181	17.5729	18.4264	19.1884	19.7653	20.0102	19.9813	19.5885	18.6371	17.4580	16.4511 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.3688	16.7681	17.4229	18.2764	19.0384	19.6153	19.8602	19.8313	19.4385	18.4871	17.3080	16.3011 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	614.7812	660.1692	674.6090	653.5866	583.2960	448.2342	317.6443	327.9127	448.6975	537.9053	570.4421	592.6452 (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	1348.2743	1321.7219	1212.7311	1026.0190	800.8196	540.3154	351.2263	368.7808	577.9976	860.6966	1120.1451	1335.5491 (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	545.7189	444.5634	400.3629	268.1513	161.8375	0.0000	0.0000	0.0000	0.0000	240.1568	395.7862	552.7205 (98)
Space heating												3009.2974 (98)
Space heating per m ²												31.7973 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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 %)												90.2000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												3336.2499	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	545.7189	444.5634	400.3629	268.1513	161.8375	0.0000	0.0000	0.0000	0.0000	240.1568	395.7862	552.7205	(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)	605.0099	492.8641	443.8613	297.2853	179.4208	0.0000	0.0000	0.0000	0.0000	266.2492	438.7873	612.7721	(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	107.7913	94.0195	97.5627	87.3555	85.0049	74.7064	71.6202	80.6093	81.0655	92.2717	98.1065	104.4901	(64)
Efficiency of water heater	87.5904	87.4428	87.1168	86.3667	84.9179	76.4000	76.4000	76.4000	76.4000	85.8936	87.0757	76.4000	(216)
(217)m	87.5904	87.4428	87.1168	86.3667	84.9179	76.4000	76.4000	76.4000	76.4000	85.8936	87.0757	87.6819	(217)
Fuel for water heating, kWh/month	123.0629	107.5212	111.9907	101.1449	100.1025	97.7832	93.7437	105.5095	106.1066	107.4257	112.6680	119.1695	(219)
Water heating fuel used	123.0629	107.5212	111.9907	101.1449	100.1025	97.7832	93.7437	105.5095	106.1066	107.4257	112.6680	1286.2283	(219)
Annual totals kWh/year													
Space heating fuel - main system												3336.2499	(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)												431.2545	(232)
Total delivered energy for all uses												5128.7328	(238)

10a. Fuel costs - using Table 12 prices

	Fuel	Fuel price	Fuel cost	
	kWh/year	p/kWh	£/year	
Space heating - main system 1	3336.2499	3.4800	116.1015	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1286.2283	3.4800	44.7607	(247)
Pumps and fans for heating	75.0000	13.1900	9.8925	(249)
Energy for lighting	431.2545	13.1900	56.8825	(250)
Additional standing charges			120.0000	(251)
Total energy cost			347.6372	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200	(256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.0456	(257)
SAP value		85.4139	
SAP rating (Section 12)		85	(258)
SAP band		B	

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

	Energy	Emission factor	Emissions	
	kWh/year	kg CO2/kWh	kg	CO2/year
Space heating - main system 1	3336.2499	0.2160	720.6300	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1286.2283	0.2160	277.8253	(264)
Space and water heating			998.4553	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	431.2545	0.5190	223.8211	(268)
Total kg/year			1261.2014	(272)
CO2 emissions per m2			13.3300	(273)
EI value			87.8974	
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	$3.48 / 0.8331 = 4.177$, stars = 5
Water heating environmental impact	$0.216 / 0.8331 = 0.2593$, stars = 5

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	47.3200 (1b)	x 2.3700 (2b)	= 112.1484 (1b) - (3b)
First floor	47.3200 (1c)	x 2.6300 (2c)	= 124.4516 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.6400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 236.6000 (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					4 * 10 = 40.0000 (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)					40.0000 / (5) = 0.1691 (8)
Pressure test					Yes
Measured/design AP50					4.7400
Infiltration rate					0.4061 (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) =	0.3756 (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	0.4601	0.4319	0.4226	0.3944	0.3944	0.3850	0.3850	0.3756	0.3756	0.4038	0.4038	0.4132 (22b)
Effective ac	0.6059	0.5933	0.5893	0.5778	0.5778	0.5741	0.5741	0.5705	0.5705	0.5815	0.5815	0.5854 (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)			11.1600	1.3258	14.7955		(27)
Flr - Ground			47.3200	0.1800	8.5176	75.6000	3577.3920 (28a)
Wl - Brick (Timber Frame)	82.3680	11.1680	71.2000	0.2100	14.9520	7.4000	526.8800 (29a)
Wl - Clad (Timber Frame)	15.3040	2.0810	13.2230	0.2100	2.7768	7.4000	97.8502 (29a)
Rf - Ins Joist	47.3200		47.3200	0.0800	3.7856	7.4000	350.1680 (30)
Total net area of external elements Aum(A, m ²)			192.3130				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	47.3355		(33)
Party Wall			43.9660	0.0000	0.0000	7.4000	325.3484 (32)
Stud			75.7405			7.4000	560.4794 (32c)
Internal Floor			47.3200			7.4000	350.1680 (32d)
Internal Ceiling			47.3200			7.4000	350.1680 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss
(28)...(30) + (32) + (32a)...(32e) = 6138.4540 (34)
64.8611 (35)
16.3874 (36)
(33) + (36) = 63.7229 (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	47.3039	46.3229	46.0096	45.1112	45.1112	44.8255	44.8255	44.5466	44.5466	45.4038	45.4038	45.7033 (38)
Heat transfer coeff	111.0268	110.0457	109.7325	108.8341	108.8341	108.5484	108.5484	108.2695	108.2695	109.1267	109.1267	109.4261 (39)
Average = Sum(39)m / 12 =												109.1490 (39)
HLP	1.1731	1.1628	1.1595	1.1500	1.1500	1.1470	1.1470	1.1440	1.1440	1.1531	1.1531	1.1562 (40)
HLP (average)												1.1533 (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												2.6841 (42)
Average daily hot water use (litres/day)												97.9464 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	107.7411	103.8232	99.9053	95.9875	92.0696	88.1518	88.1518	92.0696	95.9875	99.9053	103.8232	107.7411 (44)
Energy conte	159.7769	139.7419	144.2011	125.7180	120.6294	104.0940	96.4584	110.6874	112.0094	130.5362	142.4904	154.7354 (45)
Energy content (annual)										Total = Sum(45)m =		1541.0786 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Distribution loss (46)m = 0.15 x (45)m	23.9665	20.9613	21.6302	18.8577	18.0944	15.6141	14.4688	16.6031	16.8014	19.5804	21.3736	23.2103 (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	0.6708	0.6086	0.6483	0.5430	0.4998	0.4129	0.3826	0.4586	0.4838	0.5869	0.6206	0.6496 (61)
Total heat required for water heating calculated for each month	160.4477	140.3505	144.8494	126.2610	121.1292	104.5070	96.8411	111.1460	112.4932	131.1230	143.1110	155.3850 (62)
WWHRS	-52.6564	-46.3310	-47.2867	-38.9056	-36.1243	-29.8006	-25.2209	-30.5368	-31.4278	-38.8513	-45.0045	-50.8949 eq. (G10)
Total of WWHRS savings												-473.0406
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	107.7913	94.0195	97.5627	87.3555	85.0049	74.7064	71.6202	80.6093	81.0655	92.2717	98.1065	104.4901 (64)
Heat gains from water heating, kWh/month	53.2935	46.6163	48.1089	41.9370	40.2342	34.7145	32.1681	36.9182	37.3641	43.5500	47.5332	51.6119 (65)
Total per year (kWh/year) = Sum(64)m = 1074.6035 (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	161.0436	161.0436	161.0436	161.0436	161.0436	161.0436	161.0436	161.0436	161.0436	161.0436	161.0436	161.0436 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	61.0485	54.2228	44.0969	33.3842	24.9551	21.0681	22.7649	29.5906	39.7165	50.4292	58.8583	62.7453 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	369.1943	373.0253	363.3711	342.8185	316.8745	292.4907	276.2009	272.3698	282.0240	302.5767	328.5207	352.9044 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.7884	53.7884	53.7884	53.7884	53.7884	53.7884	53.7884	53.7884	53.7884	53.7884	53.7884	53.7884 (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)	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624 (71)
Water heating gains (Table 5)	71.6311	69.3695	64.6626	58.2458	54.0783	48.2146	43.2367	49.6213	51.8946	58.5349	66.0183	69.3709 (72)
Total internal gains	612.3435	607.0873	582.6002	544.9181	506.3774	472.2431	452.6720	462.0513	484.1047	522.0104	563.8670	595.4902 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g		FF				Access factor Table 6d	Gains W		
						Specific data or Table 6b		Specific data or Table 6c							
Northeast				3.4430	14.6130	0.7300		0.7200				0.7700	18.3259 (75)		
Southwest				7.7170	45.0642	0.7300		0.7200				0.7700	126.6685 (79)		
Solar gains	144.9944	215.5574	315.0502	419.6441	465.9871	521.7898	481.8017	441.8743	368.6595	264.5711	174.2328	121.2664 (83)			
Total gains	757.3379	822.6447	897.6504	964.5622	972.3645	994.0329	934.4737	903.9256	852.7642	786.5815	738.0998	716.7566 (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	15.3578	15.4947	15.5389	15.6672	15.6672	15.7084	15.7084	15.7489	15.7489	15.6252	15.6252	15.5824
alpha	2.0239	2.0330	2.0359	2.0445	2.0445	2.0472	2.0472	2.0499	2.0499	2.0417	2.0417	2.0388
util living area	0.8817	0.8601	0.8145	0.7380	0.6294	0.4674	0.3482	0.3483	0.5467	0.7320	0.8397	0.8891 (86)
MIT	18.5576	18.7816	19.2640	19.8645	20.4070	20.7868	20.9214	20.9241	20.6897	20.1068	19.2992	18.5510 (87)
Th 2	19.9415	19.9499	19.9526	19.9602	19.9602	19.9627	19.9627	19.9650	19.9650	19.9577	19.9577	19.9552 (88)
util rest of house	0.8683	0.8447	0.7934	0.7066	0.5799	0.3926	0.2500	0.2470	0.4737	0.6913	0.8187	0.8765 (89)
MIT 2	16.7665	17.0844	17.7640	18.5986	19.3246	19.7860	19.9211	19.9264	19.6878	18.9443	17.8283	16.7633 (90)
Living area fraction									fLA = Living area / (4) =			0.1708 (91)
MIT	17.0723	17.3742	18.0201	18.8148	19.5094	19.9569	20.0919	20.0967	19.8589	19.1428	18.0794	17.0685 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.9223	17.2242	17.8701	18.6648	19.3594	19.8069	19.9419	19.9467	19.7089	18.9928	17.9294	16.9185 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.8160	0.7913	0.7403	0.6600	0.5474	0.3804	0.2480	0.2451	0.4536	0.6460	0.7653	0.8253 (94)
Ext temp.	617.9769	650.9603	664.5501	636.6010	532.2766	378.1451	231.7048	221.5852	386.7798	508.1704	564.8404	591.5447 (95)
Heat loss rate W	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)
Month fracti	1245.9774	1224.1734	1115.9931	932.1378	681.2395	424.0842	243.3519	232.4245	455.6964	730.3613	996.2633	1216.6577 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating	467.2323	385.1992	335.8736	212.7865	110.8284	0.0000	0.0000	0.0000	0.0000	165.3100	310.6245	465.0841 (98)
Space heating per m2												2452.9387 (98)
												(98) / (4) = 25.9186 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (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

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												2719.4443 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	467.2323	385.1992	335.8736	212.7865	110.8284	0.0000	0.0000	0.0000	0.0000	165.3100	310.6245	465.0841 (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)	517.9959	427.0501	372.3654	235.9052	122.8696	0.0000	0.0000	0.0000	0.0000	183.2705	344.3731	515.6143 (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	107.7913	94.0195	97.5627	87.3555	85.0049	74.7064	71.6202	80.6093	81.0655	92.2717	98.1065	104.4901 (64)
Efficiency of water heater (217)m	87.2459	87.1129	86.6759	85.6949	83.6421	76.4000	76.4000	76.4000	76.4000	84.7183	86.4518	87.3069 (216)
Fuel for water heating, kWh/month	123.5489	107.9283	112.5603	101.9378	101.6294	97.7832	93.7437	105.5095	106.1066	108.9160	113.4811	119.6814 (219)
Water heating fuel used												1292.8261 (219)
Annual totals kWh/year												
Space heating fuel - main system												2719.4443 (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)												431.2545 (232)
Total delivered energy for all uses												4518.5249 (238)

10a. Fuel costs - using BEDF prices (531)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2719.4443	10.2300	278.1991 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1292.8261	10.2300	132.2561 (247)
Pumps and fans for heating	75.0000	36.7200	27.5400 (249)
Energy for lighting	431.2545	36.7200	158.3567 (250)
Additional standing charges			103.0000 (251)
Total energy cost			699.3519 (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	2719.4443	0.2160	587.4000 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1292.8261	0.2160	279.2504 (264)
Space and water heating			866.6504 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	431.2545	0.5190	223.8211 (268)
Total kg/year			1129.3965 (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	2719.4443	1.2200	3317.7220 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1292.8261	1.2200	1577.2478 (264)
Space and water heating			4894.9698 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	431.2545	3.0700	1323.9513 (268)
Primary energy kWh/year			6449.1712 (272)
Primary energy kWh/m2/year			68.1442 (273)

SAP 2012 EPC IMPROVEMENTS

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

(For testing purposes):

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

Recommended measures:	SAP change	Cost change	CO2 change
U Solar photovoltaic panels	+ 9.6	-£ 715	-1010 kg (89.4%)
Measures omitted - SAP change or cost saving too small:			
N Solar water heating	+ 0.9	-£ 64	-148 kg (13.1%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar photovoltaic panels	£715 10.67 kg/m²	A 95	A 96
Total Savings	£715 10.67 kg/m²		
Potential energy efficiency rating:		A 95	
Potential environmental impact rating:			A 96

Fuel prices for cost data on this page from database revision number 531 TEST (31 Oct 2023)
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	£186	£186	£0
Mains gas	£513	£513	£0
Space heating	£409	£409	£0
Water heating	£132	£132	£0
Lighting	£158	£158	£0
Generated (PV)	-£0	-£715	£715
Total cost of fuels	£699	-£16	£715
Total cost of uses	£699	-£16	£715
Delivered energy	48 kWh/m²	27 kWh/m²	21 kWh/m²
Carbon dioxide emissions	1.1 tonnes	0.1 tonnes	1.0 tonnes
CO2 emissions per m²	12 kg/m²	1 kg/m²	11 kg/m²
Primary energy	68 kWh/m²	5 kWh/m²	63 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	47.3200 (1b)	x 2.3700 (2b)	= 112.1484 (1b) - (3b)
First floor	47.3200 (1c)	x 2.6300 (2c)	= 124.4516 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.6400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 236.6000 (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					4 * 10 = 40.0000 (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) =				40.0000 / (5) =	0.1691 (8)
Pressure test					Yes
Measured/design AP50					4.7400
Infiltration rate					0.4061 (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) =		0.3756 (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	0.4789	0.4695	0.4601	0.4132	0.4038	0.3568	0.3568	0.3474	0.3756	0.4038	0.4226	0.4413 (22b)
Effective ac	0.6147	0.6102	0.6059	0.5854	0.5815	0.5637	0.5637	0.5604	0.5705	0.5815	0.5893	0.5974 (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)			11.1600	1.3258	14.7955		(27)
Flr - Ground			47.3200	0.1800	8.5176	75.6000	3577.3920 (28a)
Wl - Brick (Timber Frame)	82.3680	11.1680	71.2000	0.2100	14.9520	7.4000	526.8800 (29a)
Wl - Clad (Timber Frame)	15.3040	2.0810	13.2230	0.2100	2.7768	7.4000	97.8502 (29a)
Rf - Ins Joist	47.3200		47.3200	0.0800	3.7856	7.4000	350.1680 (30)
Total net area of external elements Aum(A, m ²)			192.3130				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	47.3355			(33)
Party Wall			43.9660	0.0000	0.0000	7.4000	325.3484 (32)
Stud			75.7405			7.4000	560.4794 (32c)
Internal Floor			47.3200			7.4000	350.1680 (32d)
Internal Ceiling			47.3200			7.4000	350.1680 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss
(28)...(30) + (32) + (32a)...(32e) = 6138.4540 (34)
64.8611 (35)
16.3874 (36)
(33) + (36) = 63.7229 (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	47.9924	47.6447	47.3039	45.7033	45.4038	44.0097	44.0097	43.7515	44.5466	45.4038	46.0096	46.6430 (38)
Heat transfer coeff	111.7153	111.3676	111.0268	109.4261	109.1267	107.7325	107.7325	107.4744	108.2695	109.1267	109.7325	110.3659 (39)
Average = Sum(39)m / 12 =												109.4247 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1804	1.1767	1.1731	1.1562	1.1531	1.1383	1.1383	1.1356	1.1440	1.1531	1.1595	1.1662 (40)
HLP (average)												1.1562 (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												2.6841 (42)
Average daily hot water use (litres/day)												97.9464 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	107.7411	103.8232	99.9053	95.9875	92.0696	88.1518	88.1518	92.0696	95.9875	99.9053	103.8232	107.7411 (44)
Energy conte	159.7769	139.7419	144.2011	125.7180	120.6294	104.0940	96.4584	110.6874	112.0094	130.5362	142.4904	154.7354 (45)
Energy content (annual)										Total = Sum(45)m =		1541.0786 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	23.9665	20.9613	21.6302	18.8577	18.0944	15.6141	14.4688	16.6031	16.8014	19.5804	21.3736	23.2103 (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	0.6708	0.6086	0.6483	0.5430	0.4998	0.4129	0.3826	0.4586	0.4838	0.5869	0.6206	0.6496 (61)
Total heat required for water heating calculated for each month	160.4477	140.3505	144.8494	126.2610	121.1292	104.5070	96.8411	111.1460	112.4932	131.1230	143.1110	155.3850 (62)
WWHRS	-52.6564	-46.3310	-47.2867	-38.9056	-36.1243	-29.8006	-25.2209	-30.5368	-31.4278	-38.8513	-45.0045	-50.8949 eq. (G10)
Total of WWHRS savings												-473.0406
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	107.7913	94.0195	97.5627	87.3555	85.0049	74.7064	71.6202	80.6093	81.0655	92.2717	98.1065	104.4901 (64)
Heat gains from water heating, kWh/month	53.2935	46.6163	48.1089	41.9370	40.2342	34.7145	32.1681	36.9182	37.3641	43.5500	47.5332	51.6119 (65)
Total per year (kWh/year) = Sum(64)m = 1074.6035 (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	161.0436	161.0436	161.0436	161.0436	161.0436	161.0436	161.0436	161.0436	161.0436	161.0436	161.0436	161.0436 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	61.0485	54.2228	44.0969	33.3842	24.9551	21.0681	22.7649	29.5906	39.7165	50.4292	58.8583	62.7453 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	369.1943	373.0253	363.3711	342.8185	316.8745	292.4907	276.2009	272.3698	282.0240	302.5767	328.5207	352.9044 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.7884	53.7884	53.7884	53.7884	53.7884	53.7884	53.7884	53.7884	53.7884	53.7884	53.7884	53.7884 (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)	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624 (71)
Water heating gains (Table 5)	71.6311	69.3695	64.6626	58.2458	54.0783	48.2146	43.2367	49.6213	51.8946	58.5349	66.0183	69.3709 (72)
Total internal gains	612.3435	607.0873	582.6002	544.9181	506.3774	472.2431	452.6720	462.0513	484.1047	522.0104	563.8670	595.4902 (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
Northeast				3.4430	11.2829		0.7300		0.7200	0.7700			14.1497 (75)
Southwest				7.7170	36.7938		0.7300		0.7200	0.7700			103.4218 (79)

Solar gains	117.5715	204.9678	292.9298	383.8792	449.0761	454.2298	434.4298	384.5056	324.2242	229.8991	141.6795	100.0629	(83)
Total gains	729.9150	812.0550	875.5300	928.7974	955.4535	926.4729	887.1019	846.5570	808.3289	751.9095	705.5465	695.5531	(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	15.2631	15.3108	15.3578	15.5824	15.6252	15.8274	15.8274	15.8654	15.7489	15.6252	15.5389	15.4498
alpha	2.0175	2.0207	2.0239	2.0388	2.0417	2.0552	2.0552	2.0577	2.0499	2.0417	2.0359	2.0300
util living area	0.9026	0.8785	0.8420	0.7803	0.6913	0.5697	0.4539	0.4844	0.6453	0.7961	0.8762	0.9100 (86)
MIT	18.1503	18.4465	18.9325	19.5695	20.1529	20.6111	20.8282	20.7970	20.4589	19.7180	18.8380	18.0980 (87)
Th 2	19.9357	19.9386	19.9415	19.9552	19.9577	19.9696	19.9696	19.9719	19.9650	19.9577	19.9526	19.9472 (88)
util rest of house	0.8921	0.8656	0.8246	0.7546	0.6514	0.5076	0.3680	0.4000	0.5884	0.7670	0.8610	0.9003 (89)
MIT 2	16.1829	16.6034	17.2929	18.1910	18.9899	19.5912	19.8417	19.8134	19.4093	18.4146	17.1738	16.1120 (90)
Living area fraction									fLA = Living area / (4)			0.1708 (91)
MIT	16.5188	16.9181	17.5729	18.4264	19.1884	19.7653	20.0102	19.9813	19.5885	18.6371	17.4580	16.4511 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.3688	16.7681	17.4229	18.2764	19.0384	19.6153	19.8602	19.8313	19.4385	18.4871	17.3080	16.3011 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	614.7812	660.1692	674.6090	653.5866	583.2960	448.2342	317.6443	327.9127	448.6975	537.9053	570.4421	592.6452 (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	1348.2743	1321.7219	1212.7311	1026.0190	800.8196	540.3154	351.2263	368.7808	577.9976	860.6966	1120.1451	1335.5491 (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	545.7189	444.5634	400.3629	268.1513	161.8375	0.0000	0.0000	0.0000	0.0000	240.1568	395.7862	552.7205 (98)
Space heating												3009.2974 (98)
Space heating per m2												31.7973 (99)
(98) / (4) =												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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 %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3336.2499 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	545.7189	444.5634	400.3629	268.1513	161.8375	0.0000	0.0000	0.0000	0.0000	240.1568	395.7862	552.7205	(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)	605.0099	492.8641	443.8613	297.2853	179.4208	0.0000	0.0000	0.0000	0.0000	266.2492	438.7873	612.7721	(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	107.7913	94.0195	97.5627	87.3555	85.0049	74.7064	71.6202	80.6093	81.0655	92.2717	98.1065	104.4901	(64)
Efficiency of water heater (217)m	87.5904	87.4428	87.1168	86.3667	84.9179	76.4000	76.4000	76.4000	76.4000	85.8936	87.0757	87.6819	(216)
Fuel for water heating, kWh/month	123.0629	107.5212	111.9907	101.1449	100.1025	97.7832	93.7437	105.5095	106.1066	107.4257	112.6680	119.1695	(219)
Water heating fuel used												1286.2283	(219)
Annual totals kWh/year													
Space heating fuel - main system												3336.2499	(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)													431.2545 (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												3401.4934	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3336.2499	3.4800	116.1015 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1286.2283	3.4800	44.7607 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	431.2545	13.1900	56.8825 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-1727.2394	13.1900	-227.8229 (252)
Total energy cost			119.8143 (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] =	0.3604 (257)
SAP value		94.9728
SAP rating (Section 12)		95 (258)
SAP band		A

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3336.2499	0.2160	720.6300 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1286.2283	0.2160	277.8253 (264)
Space and water heating			998.4553 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	431.2545	0.5190	223.8211 (268)
Energy saving/generation technologies			
PV Unit	-1727.2394	0.5190	-896.4372 (269)
Total kg/year			364.7642 (272)
CO2 emissions per m2			3.8500 (273)
EI value			96.4997
EI rating			96 (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	47.3200 (1b)	x 2.3700 (2b)	= 112.1484 (1b) - (3b)
First floor	47.3200 (1c)	x 2.6300 (2c)	= 124.4516 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.6400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 236.6000 (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					4 * 10 = 40.0000 (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)					40.0000 / (5) = 0.1691 (8)
Pressure test					Yes
Measured/design AP50					4.7400
Infiltration rate					0.4061 (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)	=	0.3756 (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	0.4601	0.4319	0.4226	0.3944	0.3944	0.3850	0.3850	0.3756	0.3756	0.4038	0.4038	0.4132 (22b)
Effective ac	0.6059	0.5933	0.5893	0.5778	0.5778	0.5741	0.5741	0.5705	0.5705	0.5815	0.5815	0.5854 (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)			11.1600	1.3258	14.7955		(27)
Flr - Ground			47.3200	0.1800	8.5176	75.6000	3577.3920 (28a)
Wl - Brick (Timber Frame)	82.3680	11.1680	71.2000	0.2100	14.9520	7.4000	526.8800 (29a)
Wl - Clad (Timber Frame)	15.3040	2.0810	13.2230	0.2100	2.7768	7.4000	97.8502 (29a)
Rf - Ins Joist	47.3200		47.3200	0.0800	3.7856	7.4000	350.1680 (30)
Total net area of external elements Aum(A, m ²)			192.3130				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		47.3355		(33)
Party Wall			43.9660	0.0000	0.0000	7.4000	325.3484 (32)
Stud			75.7405			7.4000	560.4794 (32c)
Internal Floor			47.3200			7.4000	350.1680 (32d)
Internal Ceiling			47.3200			7.4000	350.1680 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss
(28)...(30) + (32) + (32a)...(32e) = 6138.4540 (34)
64.8611 (35)
16.3874 (36)
(33) + (36) = 63.7229 (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	47.3039	46.3229	46.0096	45.1112	45.1112	44.8255	44.8255	44.5466	44.5466	45.4038	45.4038	45.7033 (38)
Heat transfer coeff	111.0268	110.0457	109.7325	108.8341	108.8341	108.5484	108.5484	108.2695	108.2695	109.1267	109.1267	109.4261 (39)
Average = Sum(39)m / 12 =												109.1490 (39)
HLP	1.1731	1.1628	1.1595	1.1500	1.1500	1.1470	1.1470	1.1440	1.1440	1.1531	1.1531	1.1562 (40)
HLP (average)												1.1533 (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												2.6841 (42)
Average daily hot water use (litres/day)												97.9464 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	107.7411	103.8232	99.9053	95.9875	92.0696	88.1518	88.1518	92.0696	95.9875	99.9053	103.8232	107.7411 (44)
Energy conte	159.7769	139.7419	144.2011	125.7180	120.6294	104.0940	96.4584	110.6874	112.0094	130.5362	142.4904	154.7354 (45)
Energy content (annual)										Total = Sum(45)m =		1541.0786 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Distribution loss (46)m = 0.15 x (45)m	23.9665	20.9613	21.6302	18.8577	18.0944	15.6141	14.4688	16.6031	16.8014	19.5804	21.3736	23.2103 (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	0.6708	0.6086	0.6483	0.5430	0.4998	0.4129	0.3826	0.4586	0.4838	0.5869	0.6206	0.6496 (61)
Total heat required for water heating calculated for each month	160.4477	140.3505	144.8494	126.2610	121.1292	104.5070	96.8411	111.1460	112.4932	131.1230	143.1110	155.3850 (62)
WWHRS	-52.6564	-46.3310	-47.2867	-38.9056	-36.1243	-29.8006	-25.2209	-30.5368	-31.4278	-38.8513	-45.0045	-50.8949 eq. (G10)
Total of WWHRS savings												-473.0406
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	107.7913	94.0195	97.5627	87.3555	85.0049	74.7064	71.6202	80.6093	81.0655	92.2717	98.1065	104.4901 (64)
Heat gains from water heating, kWh/month	53.2935	46.6163	48.1089	41.9370	40.2342	34.7145	32.1681	36.9182	37.3641	43.5500	47.5332	51.6119 (65)
Total per year (kWh/year) = Sum(64)m = 1074.6035 (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	161.0436	161.0436	161.0436	161.0436	161.0436	161.0436	161.0436	161.0436	161.0436	161.0436	161.0436	161.0436 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	61.0485	54.2228	44.0969	33.3842	24.9551	21.0681	22.7649	29.5906	39.7165	50.4292	58.8583	62.7453 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	369.1943	373.0253	363.3711	342.8185	316.8745	292.4907	276.2009	272.3698	282.0240	302.5767	328.5207	352.9044 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.7884	53.7884	53.7884	53.7884	53.7884	53.7884	53.7884	53.7884	53.7884	53.7884	53.7884	53.7884 (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)	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624	-107.3624 (71)
Water heating gains (Table 5)	71.6311	69.3695	64.6626	58.2458	54.0783	48.2146	43.2367	49.6213	51.8946	58.5349	66.0183	69.3709 (72)
Total internal gains	612.3435	607.0873	582.6002	544.9181	506.3774	472.2431	452.6720	462.0513	484.1047	522.0104	563.8670	595.4902 (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
Northeast				3.4430	14.6130	0.7300		0.7200		0.7700		18.3259 (75)
Southwest				7.7170	45.0642	0.7300		0.7200		0.7700		126.6685 (79)
Solar gains	144.9944	215.5574	315.0502	419.6441	465.9871	521.7898	481.8017	441.8743	368.6595	264.5711	174.2328	121.2664 (83)
Total gains	757.3379	822.6447	897.6504	964.5622	972.3645	994.0329	934.4737	903.9256	852.7642	786.5815	738.0998	716.7566 (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	15.3578	15.4947	15.5389	15.6672	15.6672	15.7084	15.7084	15.7489	15.7489	15.6252	15.6252	15.5824
alpha	2.0239	2.0330	2.0359	2.0445	2.0445	2.0472	2.0472	2.0499	2.0499	2.0417	2.0417	2.0388
util living area	0.8817	0.8601	0.8145	0.7380	0.6294	0.4674	0.3482	0.3483	0.5467	0.7320	0.8397	0.8891 (86)
MIT	18.5576	18.7816	19.2640	19.8645	20.4070	20.7868	20.9214	20.9241	20.6897	20.1068	19.2992	18.5510 (87)
Th 2	19.9415	19.9499	19.9526	19.9602	19.9602	19.9627	19.9627	19.9650	19.9650	19.9577	19.9577	19.9552 (88)
util rest of house	0.8683	0.8447	0.7934	0.7066	0.5799	0.3926	0.2500	0.2470	0.4737	0.6913	0.8187	0.8765 (89)
MIT 2	16.7665	17.0844	17.7640	18.5986	19.3246	19.7860	19.9211	19.9264	19.6878	18.9443	17.8283	16.7633 (90)
Living area fraction	17.0723	17.3742	18.0201	18.8148	19.5094	19.9569	20.0919	20.0967	19.8589	19.1428	18.0794	17.0685 (92)
MIT	16.9223	17.2242	17.8701	18.6648	19.3594	19.8069	19.9419	19.9467	19.7089	18.9928	17.9294	16.9185 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.8160	0.7913	0.7403	0.6600	0.5474	0.3804	0.2480	0.2451	0.4536	0.6460	0.7653	0.8253 (94)
Ext temp.	617.9769	650.9603	664.5501	636.6010	532.2766	378.1451	231.7048	221.5852	386.7798	508.1704	564.8404	591.5447 (95)
Heat loss rate W	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)
Month fracti	1245.9774	1224.1734	1115.9931	932.1378	681.2395	424.0842	243.3519	232.4245	455.6964	730.3613	996.2633	1216.6577 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating	467.2323	385.1992	335.8736	212.7865	110.8284	0.0000	0.0000	0.0000	0.0000	165.3100	310.6245	465.0841 (98)
Space heating per m ²												2452.9387 (98)
												(98) / (4) = 25.9186 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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 %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2719.4443 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	467.2323	385.1992	335.8736	212.7865	110.8284	0.0000	0.0000	0.0000	0.0000	165.3100	310.6245	465.0841	(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)	517.9959	427.0501	372.3654	235.9052	122.8696	0.0000	0.0000	0.0000	0.0000	183.2705	344.3731	515.6143	(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	107.7913	94.0195	97.5627	87.3555	85.0049	74.7064	71.6202	80.6093	81.0655	92.2717	98.1065	104.4901	(64)
Efficiency of water heater (217)m	87.2459	87.1129	86.6759	85.6949	83.6421	76.4000	76.4000	76.4000	76.4000	84.7183	86.4518	87.3069	(216)
Fuel for water heating, kWh/month	123.5489	107.9283	112.5603	101.9378	101.6294	97.7832	93.7437	105.5095	106.1066	108.9160	113.4811	119.6814	(219)
Water heating fuel used													(219)
Annual totals kWh/year													
Space heating fuel - main system													2719.4443 (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)													431.2545 (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													2572.0789 (238)

10a. Fuel costs - using BEDF prices (531)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2719.4443	10.2300	278.1991 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1292.8261	10.2300	132.2561 (247)
Pumps and fans for heating	75.0000	36.7200	27.5400 (249)
Energy for lighting	431.2545	36.7200	158.3567 (250)
Additional standing charges			103.0000 (251)
Energy saving/generation technologies			
PV Unit	-1946.4459	36.7200	-714.7349 (252)
Total energy cost			-15.3830 (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	2719.4443	0.2160	587.4000 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1292.8261	0.2160	279.2504 (264)
Space and water heating			866.6504 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	431.2545	0.5190	223.8211 (268)
Energy saving/generation technologies			
PV Unit	-1946.4459	0.5190	-1010.2054 (269)
Total kg/year			119.1910 (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	2719.4443	1.2200	3317.7220 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1292.8261	1.2200	1577.2478 (264)
Space and water heating			4894.9698 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	431.2545	3.0700	1323.9513 (268)
Energy saving/generation technologies			
PV Unit	-1946.4459	3.0700	-5975.5890 (269)
Primary energy kWh/year			473.5821 (272)
Primary energy kWh/m2/year			5.0040 (273)

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Built)

Property Reference	002 - PRJ01301 (2)	Issued on Date	30/11/2023
Assessment Reference	002	Prop Type Ref	C-SP
Property	2 Erwood Close, Netley Abbey, Southampton, SO31 5TJ		
SAP Rating	85 B	DER	14.28
Environmental	88 B	TER	17.14
CO ₂ Emissions (t/year)	1.13	% DER<TER	16.67
General Requirements Compliance	Pass	DFEE	43.36
		TFEE	48.44
		% DFEE<TFEE	10.47
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)	17.14	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.28	kgCO ₂ /m ²	Pass
	-2.86 (-16.7%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	48.44	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	43.36	kWh/m ² /yr	
	-5.0 (-10.3%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

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

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.74 (measured in this dwelling)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Built)

Main heating system

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

Pass

Secondary heating system

None

5 Cylinder insulation

Hot water storage

No cylinder

6 Controls

Space heating controls

Time and temperature zone control

Pass

Hot water controls

No cylinder

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100 %

Minimum

75 %

Pass

8 Mechanical ventilation

Not applicable

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Southern England)

Slight

Pass

Based on:

Overshading

Average

Windows facing North East

3.44 m², No overhang

Windows facing South West

7.72 m², No overhang

Air change rate

4.68 ach

Blinds/curtains

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

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

4.74 (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