

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

Property Reference	042 - PRJ013014			Issued on Date	11/01/2024
Assessment Reference	042	Prop Type Ref	D		
Property	23 Deeble Way, Netley Abbey, Southampton, SO31 5JP				
SAP Rating	85 B	DER	14.62	TER	17.38
Environmental	87 B	% DER<TER	15.87		
CO ₂ Emissions (t/year)	1.17	DFEE	47.19	TFEE	51.98
General Requirements Compliance	Pass	% DFEE<TFEE	9.22		
Assessor Details	Mr. Christopher Nicholls, Briary Energy Limited, Tel: 0203 397 1373, chris@briaryenergy.co.uk			Assessor ID	U903-0001
Client					

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

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DWELLING AS BUILT

End-Terrace House, total floor area 96 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) 17.38 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 14.62 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 52.0 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 47.2 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	1.38 (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: 4.59 (measured in this dwelling)
Maximum 10.0 OK

4 Heating efficiency

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

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls: No cylinder

Boiler interlock Yes OK

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Southern England): Slight OK

Based on:

Overshading: Average
Windows facing North: 7.17 m², No overhang
Windows facing South: 5.25 m², No overhang
Windows facing West: 7.22 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	47.8200 (1b)	x 2.3700 (2b)	= 113.3334 (1b) - (3b)
First floor	47.8200 (1c)	x 2.6200 (2c)	= 125.2884 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	95.6400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 238.6218 (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) = 0.1676 (8)
Pressure test					Yes
Measured/design AP50					4.5900
Infiltration rate					0.3971 (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) =				0.3673 (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	0.4684	0.4592	0.4500	0.4041	0.3949	0.3490	0.3490	0.3398	0.3673	0.3949	0.4133	0.4316 (22b)
Effective ac	0.6097	0.6054	0.6012	0.5816	0.5780	0.5609	0.5609	0.5577	0.5675	0.5780	0.5854	0.5932 (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			2.0400	1.2000	2.4480		(26)
Windows (Uw = 1.40)			19.6300	1.3258	26.0379		(27)
Flr - Ground			47.8170	0.1800	8.6071	75.6000	3614.9652 (28a)
Wl - Brick (Timber Frame)	98.8910	21.6710	77.2200	0.2100	16.2162	7.4000	571.4280 (29a)
Rf - Ins Joist	47.8170		47.8170	0.0800	3.8254	7.4000	353.8458 (30)
Total net area of external elements Aum(A, m ²)			194.5340				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	57.1345		(33)
Party Wall			41.7120	0.0000	0.0000	7.4000	308.6688 (32)
Stud			75.3423			7.4000	557.5330 (32c)
Internal Floor			47.8170			7.4000	353.8458 (32d)
Internal Ceiling			47.8170			7.4000	353.8458 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	6114.1324 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							63.9286 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							19.5339 (36)
Total fabric heat loss						(33) + (36) =	76.6684 (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	48.0096	47.6742	47.3454	45.8013	45.5125	44.1676	44.1676	43.9185	44.6856	45.5125	46.0969	46.7079 (38)
Heat transfer coeff	124.6780	124.3426	124.0138	122.4697	122.1809	120.8360	120.8360	120.5869	121.3540	122.1809	122.7653	123.3763 (39)
Average = Sum(39)m / 12 =												122.4684 (39)
HLP	1.3036	1.3001	1.2967	1.2805	1.2775	1.2634	1.2634	1.2608	1.2689	1.2775	1.2836	1.2900 (40)
HLP (average)												1.2805 (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												2.6953 (42)
Average daily hot water use (litres/day)												98.2141 (43)
Daily hot water use	108.0356	104.1070	100.1784	96.2499	92.3213	88.3927	88.3927	92.3213	96.2499	100.1784	104.1070	108.0356 (44)
Energy conte	160.2136	140.1239	144.5953	126.0617	120.9592	104.3786	96.7221	110.9900	112.3156	130.8930	142.8799	155.1583 (45)
Energy content (annual)										Total = Sum(45)m =		1545.2910 (45)
Distribution loss (46)m = 0.15 x (45)m												

Water storage loss:	24.0320	21.0186	21.6893	18.9092	18.1439	15.6568	14.5083	16.6485	16.8473	19.6339	21.4320	23.2738 (46)
Total storage loss												
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 (56)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Total heat required for water heating calculated for each month	0.6707	0.6087	0.6507	0.5460	0.5025	0.4152	0.3847	0.4611	0.4865	0.5890	0.6206	0.6496 (61)
WWHRS	160.8844	140.7325	145.2459	126.6077	121.4617	104.7937	97.1068	111.4511	112.8020	131.4820	143.5005	155.8079 (62)
Total of WWHRS savings	-52.8470	-46.4987	-47.4579	-39.0458	-36.2542	-29.9075	-25.3110	-30.6460	-31.5404	-38.9909	-45.1668	-51.0792 eq. (G10)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-474.7454
Output from w/h								Solar input	(sum of months) =	Sum(63)m =		0.0000 (63)
	108.0374	94.2338	97.7880	87.5619	85.2075	74.8862	71.7958	80.8051	81.2617	92.4911	98.3337	104.7287 (64)
Heat gains from water heating, kWh/month								Total per year (kWh/year) =	Sum(64)m =			1077.1309 (65)
	53.4387	46.7433	48.2406	42.0520	40.3446	34.8097	32.2563	37.0195	37.4665	43.6692	47.6627	51.7525 (65)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8840	0.8444	0.7885	0.7047	0.5974	0.4681	0.3470	0.3860	0.5687	0.7477	0.8511	0.8946 (94)
Useful gains	511.2521	597.7089	658.7718	681.0491	630.5708	488.9017	345.5070	353.1088	466.2949	514.8469	493.9132	482.8847 (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	1413.1643	1400.7149	1301.4973	1117.7227	880.7463	595.6909	385.5950	403.9336	628.2372	918.3143	1178.1566	1399.0586 (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	671.0227	539.6200	478.1878	314.4050	186.1306	0.0000	0.0000	0.0000	0.0000	300.1798	492.6553	681.6334 (98)
Space heating												3663.8345 (99)
Space heating per m2												38.3086 (99)
										(98) / (4) =		

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 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													4061.9008 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	671.0227	539.6200	478.1878	314.4050	186.1306	0.0000	0.0000	0.0000	0.0000	300.1798	492.6553	681.6334	(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)	743.9276	598.2483	530.1417	348.5643	206.3532	0.0000	0.0000	0.0000	0.0000	332.7935	546.1810	755.6911	(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	108.0374	94.2338	97.7880	87.5619	85.2075	74.8862	71.7958	80.8051	81.2617	92.4911	98.3337	104.7287	(64)
Efficiency of water heater (217)m	87.9958	87.8411	87.5162	86.7853	85.3583	76.4000	76.4000	76.4000	76.4000	86.5190	87.5682	76.4000	(216)
Fuel for water heating, kWh/month	122.7756	107.2775	111.7371	100.8948	99.8233	98.0186	93.9736	105.7659	106.3635	106.9027	112.2939	118.9003	(219)
Water heating fuel used												1284.7268	(219)
Annual totals kWh/year													
Space heating fuel - main system												4061.9008	(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)												393.0884	(232)
Total delivered energy for all uses												5814.7160	(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	4061.9008	0.2160	877.3706 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1284.7268	0.2160	277.5010 (264)
Space and water heating			1154.8716 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	393.0884	0.5190	204.0129 (268)
Total CO2, kg/year			1397.8094 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			14.6200 (273)

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

DER			14.6200 ZC1
Total Floor Area		TFA	95.6400
Assumed number of occupants		N	2.6953
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			15.4329 ZC2
CO2 emissions from cooking, equation (L16)			1.9206 ZC3
Total CO2 emissions			31.9735 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			31.9735 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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	47.8200 (1b)	x 2.3700 (2b)	= 113.3334 (1b) - (3b)
First floor	47.8200 (1c)	x 2.6200 (2c)	= 125.2884 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	95.6400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 238.6218 (5)

2. Ventilation rate

										main	secondary	other	total	m3 per hour										
										heating	heating													
Number of chimneys										0	+	0	+	0	=	0 * 40 =	0.0000 (6a)							
Number of open flues										0	+	0	+	0	=	0 * 20 =	0.0000 (6b)							
Number of intermittent fans																3 * 10 =	30.0000 (7a)							
Number of passive vents																0 * 10 =	0.0000 (7b)							
Number of flueless gas fires																0 * 40 =	0.0000 (7c)							
										Air changes per hour														
Infiltration due to chimneys, flues and fans										= (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000	/ (5) =	0.1257 (8)							
Pressure test										Yes														
Measured/design AP50										5.0000														
Infiltration rate										0.3757 (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) =					0.3475 (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													0.4431	0.4344	0.4257	0.3823	0.3736	0.3302	0.3302	0.3215	0.3475	0.3736	0.3910	0.4084 (22b)
Effective ac													0.5982	0.5944	0.5906	0.5731	0.5698	0.5545	0.5545	0.5517	0.5604	0.5698	0.5764	0.5834 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			2.0400	1.0000	2.0400		(26)					
TER Opening Type (Uw = 1.40)			19.6300	1.3258	26.0379		(27)					
Flr - Ground			47.8170	0.1300	6.2162		(28a)					
Wl - Brick (Timber Frame)	98.8910	21.6710	77.2200	0.1800	13.8996		(29a)					
Rf - Ins Joist	47.8170		47.8170	0.1300	6.2162		(30)					
Total net area of external elements Aum(A, m2)			194.5340				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		54.4099		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.6545 (36)					
Total fabric heat loss						(33) + (36) =	65.0644 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 47.1035	Feb 46.8033	Mar 46.5091	Apr 45.1269	May 44.8684	Jun 43.6646	Jul 43.6646	Aug 43.4417	Sep 44.1283	Oct 44.8684	Nov 45.3915	Dec 45.9384 (38)
Heat transfer coeff	112.1679	111.8677	111.5735	110.1913	109.9328	108.7290	108.7290	108.5061	109.1927	109.9328	110.4559	111.0028 (39)
Average = Sum(39)m / 12 =												110.1901 (39)
HLP	Jan 1.1728	Feb 1.1697	Mar 1.1666	Apr 1.1521	May 1.1494	Jun 1.1369	Jul 1.1369	Aug 1.1345	Sep 1.1417	Oct 1.1494	Nov 1.1549	Dec 1.1606 (40)
HLP (average)												1.1521 (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												2.6953 (42)
Average daily hot water use (litres/day)												98.2141 (43)
Daily hot water use	Jan 108.0356	Feb 104.1070	Mar 100.1784	Apr 96.2499	May 92.3213	Jun 88.3927	Jul 88.3927	Aug 92.3213	Sep 96.2499	Oct 100.1784	Nov 104.1070	Dec 108.0356 (44)
Energy conte	160.2136	140.1239	144.5953	126.0617	120.9592	104.3786	96.7221	110.9900	112.3156	130.8930	142.8799	155.1583 (45)
Energy content (annual)												Total = Sum(45)m = 1545.2910 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:	24.0320	21.0186	21.6893	18.9092	18.1439	15.6568	14.5083	16.6485	16.8473	19.6339	21.4320	23.2738 (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)
If cylinder contains dedicated solar storage												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Total heat required for water heating calculated for each month	50.9589	46.0274	50.9589	47.4657	47.0459	43.5909	45.0440	47.0459	47.4657	50.9589	49.3151	50.9589 (61)
Solar input	211.1725	186.1513	195.5542	173.5273	168.0051	147.9695	141.7660	158.0359	159.7813	181.8519	192.1950	206.1172 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	211.1725	186.1513	195.5542	173.5273	168.0051	147.9695	141.7660	158.0359	159.7813	181.8519	192.1950	206.1172 (64)
	66.0108	58.0980	60.8177	53.7819	51.9804	45.6036	43.4211	48.6657	49.2113	56.2616	59.8363	64.3299 (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	134.7666	134.7666	134.7666	134.7666	134.7666	134.7666	134.7666	134.7666	134.7666	134.7666	134.7666	134.7666	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.3063	19.8123	16.1124	12.1981	9.1183	7.6980	8.3180	10.8120	14.5119	18.4262	21.5060	22.9263	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	249.0804	251.6651	245.1518	231.2858	213.7824	197.3317	186.3416	183.7569	190.2702	204.1362	221.6396	238.0904	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.4767	36.4767	36.4767	36.4767	36.4767	36.4767	36.4767	36.4767	36.4767	36.4767	36.4767	36.4767	(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)	-107.8133	-107.8133	-107.8133	-107.8133	-107.8133	-107.8133	-107.8133	-107.8133	-107.8133	-107.8133	-107.8133	-107.8133	(71)
Water heating gains (Table 5)	88.7241	86.4554	81.7442	74.6971	69.8661	63.3383	58.3617	65.4108	68.3491	75.6205	83.1060	86.4649	(72)
Total internal gains	426.5409	424.3628	409.4384	384.6110	359.1968	334.7980	319.4512	326.4097	339.5612	364.6129	392.6817	413.9115	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
North					7.1650	10.6334	0.6300	0.7000			0.7700			23.2841 (74)
South					5.2480	46.7521	0.6300	0.7000			0.7700			74.9836 (78)
West					7.2210	19.6403	0.6300	0.7000			0.7700			43.3428 (80)
Solar gains	141.6105	252.0886	371.6750	501.8983	597.4196	607.9342	579.9894	506.9022	416.7186	286.0312	171.6484	119.8465	(83)	
Total gains	568.1514	676.4514	781.1134	886.5094	956.6164	942.7322	899.4406	833.3119	756.2798	650.6441	564.3301	533.7580	(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	59.2118	59.3707	59.5273	60.2739	60.4157	61.0846	61.0846	61.2101	60.8252	60.4157	60.1296	59.8333	
alpha	4.9475	4.9580	4.9685	5.0183	5.0277	5.0723	5.0723	5.0807	5.0550	5.0277	5.0086	4.9889	
util living area	0.9981	0.9951	0.9859	0.9527	0.8605	0.6889	0.5215	0.5804	0.8333	0.9738	0.9958	0.9986	(86)
MIT	19.7227	19.8964	20.1701	20.5203	20.8044	20.9543	20.9908	20.9847	20.8788	20.4994	20.0450	19.6947	(87)
Th 2	19.9418	19.9443	19.9468	19.9585	19.9607	19.9708	19.9708	19.9727	19.9669	19.9607	19.9562	19.9516	(88)
util rest of house	0.9974	0.9935	0.9809	0.9352	0.8117	0.5975	0.4049	0.4601	0.7588	0.9608	0.9941	0.9981	(89)
MIT 2	18.2405	18.4955	18.8942	19.3986	19.7713	19.9410	19.9675	19.9666	19.8707	19.3797	18.7218	18.2065	(90)
Living area fraction	18.5320	18.7710	19.1451	19.6192	19.9745	20.1403	20.1688	20.1668	20.0690	19.5999	18.9820	18.4992	(91)
MIT	18.5320	18.7710	19.1451	19.6192	19.9745	20.1403	20.1688	20.1668	20.0690	19.5999	18.9820	18.4992	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5320	18.7710	19.1451	19.6192	19.9745	20.1403	20.1688	20.1668	20.0690	19.5999	18.9820	18.4992	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9961	0.9907	0.9756	0.9281	0.8124	0.6135	0.4279	0.4837	0.7672	0.9548	0.9916	0.9971	(94)
Ext temp.	565.9405	670.1867	762.0774	822.7846	777.1660	578.3799	384.9097	403.0656	580.2282	621.2083	559.6067	532.2138	(95)
Heat loss rate W	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)
Month fracti	1596.3769	1551.7216	1410.8576	1181.1614	909.6351	602.3900	388.0313	408.7212	651.7690	989.3885	1312.4401	1587.2510	(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	766.6447	592.3915	482.6924	258.0313	98.5571	0.0000	0.0000	0.0000	0.0000	273.9260	542.0400	784.9477	(98)
Space heating per m2												3799.2307	(98)
												39.7243	(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												4067.6989 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	766.6447	592.3915	482.6924	258.0313	98.5571	0.0000	0.0000	0.0000	0.0000	273.9260	542.0400	784.9477 (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)	820.8187	634.2521	516.8013	276.2648	105.5215	0.0000	0.0000	0.0000	0.0000	293.2827	580.3427	840.4151 (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	211.1725	186.1513	195.5542	173.5273	168.0051	147.9695	141.7660	158.0359	159.7813	181.8519	192.1950	206.1172 (64)
Efficiency of water heater (217)m	88.0094	87.7607	87.2364	86.0481	83.7600	80.3000	80.3000	80.3000	80.3000	86.0801	87.5185	80.3000 (216)
Fuel for water heating, kWh/month	239.9433	212.1123	224.1658	201.6631	200.5791	184.2709	176.5455	196.8069	198.9804	211.2589	219.6049	88.0955 (217)
Water heating fuel used												233.9702 (219)
Annual totals kWh/year												2499.9012 (219)
Space heating fuel - main system												4067.6989 (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)												393.9367 (232)
Total delivered energy for all uses												7036.5367 (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	4067.6989	0.2160	878.6230 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2499.9012	0.2160	539.9787 (264)
Space and water heating			1418.6016 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	393.9367	0.5190	204.4531 (268)
Total CO2, kg/m2/year			1661.9797 (272)
Emissions per m2 for space and water heating			14.8327 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.1377 (272b)
Emissions per m2 for pumps and fans			0.4070 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.8327 * 1.00) + 2.1377 + 0.4070, rounded to 2 d.p.			17.3800 (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	47.8200 (1b)	x 2.3700 (2b)	= 113.3334 (1b) - (3b)
First floor	47.8200 (1c)	x 2.6200 (2c)	= 125.2884 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	95.6400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 238.6218 (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) = 0.1257 (8)
Pressure test					Yes
Measured/design AP50					4.5900
Infiltration rate					0.3552 (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) =	0.3286 (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												
Effective ac	0.4189	0.4107	0.4025	0.3614	0.3532	0.3122	0.3122	0.3039	0.3286	0.3532	0.3697	0.3861 (22b)
	0.5878	0.5843	0.5810	0.5653	0.5624	0.5487	0.5487	0.5462	0.5540	0.5624	0.5683	0.5745 (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			2.0400	1.2000	2.4480		(26)
Windows (Uw = 1.40)			19.6300	1.3258	26.0379		(27)
Flr - Ground			47.8170	0.1800	8.6071	75.6000	3614.9652 (28a)
Wl - Brick (Timber Frame)	98.8910	21.6710	77.2200	0.2100	16.2162	7.4000	571.4280 (29a)
Rf - Ins Joist	47.8170		47.8170	0.0800	3.8254	7.4000	353.8458 (30)
Total net area of external elements Aum(A, m ²)			194.5340				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	57.1345		(33)
Party Wall			41.7120	0.0000	0.0000	7.4000	308.6688 (32)
Stud			75.3423			7.4000	557.5330 (32c)
Internal Floor			47.8170			7.4000	353.8458 (32d)
Internal Ceiling			47.8170			7.4000	353.8458 (32e)

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

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	46.2829	46.0146	45.7515	44.5161	44.2850	43.2090	43.2090	43.0097	43.6235	44.2850	44.7526	45.2414 (38)
Average = Sum(39)m / 12 =	122.9513	122.6830	122.4199	121.1845	120.9534	119.8774	119.8774	119.6781	120.2919	120.9534	121.4210	121.9098 (39)
	121.1834											(39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2856	1.2828	1.2800	1.2671	1.2647	1.2534	1.2534	1.2513	1.2578	1.2647	1.2696	1.2747 (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												2.6953 (42)
Average daily hot water use (litres/day)												98.2141 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	108.0356	104.1070	100.1784	96.2499	92.3213	88.3927	88.3927	92.3213	96.2499	100.1784	104.1070	108.0356 (44)
Energy content (annual)	160.2136	140.1239	144.5953	126.0617	120.9592	104.3786	96.7221	110.9900	112.3156	130.8930	142.8799	155.1583 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1545.2910 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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)
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	34.0454	29.7763	30.7265	26.7881	25.7038	22.1804	20.5534	23.5854	23.8671	27.8148	30.3620	32.9711 (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	134.7666	134.7666	134.7666	134.7666	134.7666	134.7666	134.7666	134.7666	134.7666	134.7666	134.7666	134.7666	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.2583	19.7696	16.0777	12.1719	9.0986	7.6814	8.3001	10.7887	14.4806	18.3865	21.4597	22.8769	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	249.0804	251.6651	245.1518	231.2858	213.7824	197.3317	186.3416	183.7569	190.2702	204.1362	221.6396	238.0904	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.4767	36.4767	36.4767	36.4767	36.4767	36.4767	36.4767	36.4767	36.4767	36.4767	36.4767	36.4767	(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)	-107.8133	-107.8133	-107.8133	-107.8133	-107.8133	-107.8133	-107.8133	-107.8133	-107.8133	-107.8133	-107.8133	-107.8133	(71)
Water heating gains (Table 5)	45.7599	44.3100	41.2991	37.2057	34.5481	30.8062	27.6256	31.7008	33.1487	37.3854	42.1694	44.3161	(72)
Total internal gains	380.5287	379.1747	365.9586	344.0933	320.8591	299.2493	285.6972	289.6764	301.3295	323.3381	348.6988	368.7133	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North				7.1650	10.6334	0.7300	0.7200	0.7700	27.7509 (74)			
South				5.2480	46.7521	0.7300	0.7200	0.7700	89.3682 (78)			
West				7.2210	19.6403	0.7300	0.7200	0.7700	51.6575 (80)			
Solar gains	168.7766	300.4485	442.9759	598.1809	712.0267	724.5583	691.2526	604.1447	496.6606	340.9025	204.5769	142.8375 (83)
Total gains	549.3053	679.6232	808.9345	942.2742	1032.8858	1023.8076	976.9499	893.8211	797.9901	664.2406	553.2757	511.5508 (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	13.8134	13.8436	13.8733	14.0147	14.0415	14.1676	14.1676	14.1911	14.1187	14.0415	13.9875	13.9314	
alpha	1.9209	1.9229	1.9249	1.9343	1.9361	1.9445	1.9445	1.9461	1.9412	1.9361	1.9325	1.9288	
util living area	0.9406	0.9118	0.8667	0.7910	0.6871	0.5621	0.4504	0.4947	0.6729	0.8381	0.9190	0.9474	(86)
MIT	17.5520	17.9546	18.5841	19.3687	20.0597	20.5636	20.8009	20.7532	20.3342	19.4118	18.3349	17.4747	(87)
Th 2	19.8522	19.8544	19.8565	19.8667	19.8686	19.8775	19.8775	19.8791	19.8741	19.8686	19.8648	19.8607	(88)
util rest of house	0.9333	0.9013	0.8505	0.7645	0.6447	0.4957	0.3583	0.4029	0.6134	0.8115	0.9077	0.9410	(89)
MIT 2	16.7119	17.1087	17.7261	18.4898	19.1390	19.5927	19.7799	19.7511	19.4080	18.5504	17.4969	16.6412	(90)
Living area fraction									fLA = Living area / (4) =			0.1967	(91)
MIT	16.8772	17.2751	17.8949	18.6626	19.3201	19.7836	19.9807	19.9482	19.5902	18.7198	17.6617	16.8052	(92)
Temperature adjustment												0.0000	
adjusted MIT	16.8772	17.2751	17.8949	18.6626	19.3201	19.7836	19.9807	19.9482	19.5902	18.7198	17.6617	16.8052	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	498.3206	591.1464	659.5267	688.7748	641.6948	501.2852	358.9425	365.6877	475.6730	516.5657	485.5472	468.9515	(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	1546.3773	1518.2109	1394.9601	1183.0789	921.6712	621.4008	405.2664	424.6361	660.4249	982.1167	1282.4119	1536.6951	(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	779.7542	622.9873	547.1625	355.8989	208.3025	0.0000	0.0000	0.0000	0.0000	346.3699	573.7425	794.4012	(98)
Space heating												4228.6191	(98)
Space heating per m2												44.2139	(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	1126.8476	887.0928	909.5539	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7062	0.7638	0.7337	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	795.7529	677.5911	667.3488	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	1299.1950	1242.2291	1146.8537	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												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	362.4783	420.0907	356.7517	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												1139.3207 (104)
Cooled fraction									fC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)												
Intermittency factor	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												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	90.6196	105.0227	89.1879	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												284.8302 (107)
Space cooling per m2												2.9781 (108)
Energy for space heating												44.2139 (99)
Energy for space cooling												2.9781 (108)
Total												47.1921 (109)
Dwelling Fabric Energy Efficiency (DFEE)												47.2 (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	47.8200 (1b)	x 2.3700 (2b)	= 113.3334 (1b) - (3b)
First floor	47.8200 (1c)	x 2.6200 (2c)	= 125.2884 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	95.6400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	238.6218 (5)

2. Ventilation rate

										main	secondary	other	total	m3 per hour										
										heating	heating													
Number of chimneys										0	+	0	+	0	=	0 * 40 =	0.0000 (6a)							
Number of open flues										0	+	0	+	0	=	0 * 20 =	0.0000 (6b)							
Number of intermittent fans																3 * 10 =	30.0000 (7a)							
Number of passive vents																0 * 10 =	0.0000 (7b)							
Number of flueless gas fires																0 * 40 =	0.0000 (7c)							
										Air changes per hour														
Infiltration due to chimneys, flues and fans										= (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000	/ (5) =	0.1257 (8)							
Pressure test										Yes														
Measured/design AP50										5.0000														
Infiltration rate										0.3757 (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) =					0.3475 (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													0.4431	0.4344	0.4257	0.3823	0.3736	0.3302	0.3302	0.3215	0.3475	0.3736	0.3910	0.4084 (22b)
Effective ac													0.5982	0.5944	0.5906	0.5731	0.5698	0.5545	0.5545	0.5517	0.5604	0.5698	0.5764	0.5834 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			2.0400	1.0000	2.0400		(26)					
TER Opening Type (Uw = 1.40)			19.6300	1.3258	26.0379		(27)					
Flr - Ground			47.8170	0.1300	6.2162		(28a)					
Wl - Brick (Timber Frame)	98.8910	21.6710	77.2200	0.1800	13.8996		(29a)					
Rf - Ins Joist	47.8170		47.8170	0.1300	6.2162		(30)					
Total net area of external elements Aum(A, m2)			194.5340				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	54.4099		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.6545 (36)					
Total fabric heat loss						(33) + (36) =	65.0644 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 47.1035	Feb 46.8033	Mar 46.5091	Apr 45.1269	May 44.8684	Jun 43.6646	Jul 43.6646	Aug 43.4417	Sep 44.1283	Oct 44.8684	Nov 45.3915	Dec 45.9384 (38)
Heat transfer coeff	112.1679	111.8677	111.5735	110.1913	109.9328	108.7290	108.7290	108.5061	109.1927	109.9328	110.4559	111.0028 (39)
Average = Sum(39)m / 12 =												110.1901 (39)
HLP	Jan 1.1728	Feb 1.1697	Mar 1.1666	Apr 1.1521	May 1.1494	Jun 1.1369	Jul 1.1369	Aug 1.1345	Sep 1.1417	Oct 1.1494	Nov 1.1549	Dec 1.1606 (40)
HLP (average)												1.1521 (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												2.6953 (42)
Average daily hot water use (litres/day)												98.2141 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	108.0356	104.1070	100.1784	96.2499	92.3213	88.3927	88.3927	92.3213	96.2499	100.1784	104.1070	108.0356 (44)
Energy conte	160.2136	140.1239	144.5953	126.0617	120.9592	104.3786	96.7221	110.9900	112.3156	130.8930	142.8799	155.1583 (45)
Energy content (annual)											Total = Sum(45)m =	1545.2910 (45)
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												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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 (57)
Heat gains from water heating, kWh/month	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)
	34.0454	29.7763	30.7265	26.7881	25.7038	22.1804	20.5534	23.5854	23.8671	27.8148	30.3620	32.9711 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	134.7666	134.7666	134.7666	134.7666	134.7666	134.7666	134.7666	134.7666	134.7666	134.7666	134.7666	134.7666 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	22.3063	19.8123	16.1124	12.1981	9.1183	7.6980	8.3180	10.8120	14.5119	18.4262	21.5060	22.9263 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	249.0804	251.6651	245.1518	231.2858	213.7824	197.3317	186.3416	183.7569	190.2702	204.1362	221.6396	238.0904 (68)
Pumps, fans	36.4767	36.4767	36.4767	36.4767	36.4767	36.4767	36.4767	36.4767	36.4767	36.4767	36.4767	36.4767 (69)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (Table 5)	-107.8133	-107.8133	-107.8133	-107.8133	-107.8133	-107.8133	-107.8133	-107.8133	-107.8133	-107.8133	-107.8133	-107.8133 (71)
Total internal gains	45.7599	44.3100	41.2991	37.2057	34.5481	30.8062	27.6256	31.7008	33.1487	37.3854	42.1694	44.3161 (72)
	380.5767	379.2174	365.9933	344.1196	320.8788	299.2658	285.7151	289.6997	301.3608	323.3778	348.7451	368.7627 (73)

6. Solar gains												

[Jan]			Area	Solar flux		g		FF		Access		Gains
			m2	Table 6a		Specific data		Specific data		factor		W
				W/m2		or Table 6b		or Table 6c		Table 6d		
North			7.1650	10.6334		0.6300		0.7000		0.7700		23.2841 (74)
South			5.2480	46.7521		0.6300		0.7000		0.7700		74.9836 (78)
West			7.2210	19.6403		0.6300		0.7000		0.7700		43.3428 (80)

Solar gains	141.6105	252.0886	371.6750	501.8983	597.4196	607.9342	579.9894	506.9022	416.7186	286.0312	171.6484	119.8465 (83)
Total gains	522.1872	631.3060	737.6683	846.0179	918.2984	907.2001	865.7045	796.6019	718.0794	609.4090	520.3935	488.6092 (84)

7. Mean internal temperature (heating season)												

Temperature during heating periods in the living area from Table 9, Thl (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	59.2118	59.3707	59.5273	60.2739	60.4157	61.0846	61.0846	61.2101	60.8252	60.4157	60.1296	59.8333
alpha	4.9475	4.9580	4.9685	5.0183	5.0277	5.0723	5.0723	5.0807	5.0550	5.0277	5.0086	4.9889
util living area	0.9987	0.9964	0.9889	0.9601	0.8755	0.7089	0.5401	0.6035	0.8542	0.9798	0.9971	0.9991 (86)
MIT	19.6782	19.8532	20.1303	20.4886	20.7855	20.9481	20.9893	20.9819	20.8623	20.4636	20.0027	19.6507 (87)
Th 2	19.9418	19.9443	19.9468	19.9585	19.9607	19.9708	19.9708	19.9727	19.9669	19.9607	19.9562	19.9516 (88)
util rest of house	0.9983	0.9952	0.9848	0.9449	0.8294	0.6173	0.4202	0.4801	0.7838	0.9694	0.9958	0.9988 (89)
MIT 2	18.7358	18.9123	19.1892	19.5470	19.8168	19.9473	19.9682	19.9676	19.8904	19.5302	19.0715	18.7163 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.9212	19.0974	19.3743	19.7322	20.0073	20.1441	20.1690	20.1671	20.0816	19.7138	19.2546	18.9001 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.9212	19.0974	19.3743	19.7322	20.0073	20.1441	20.1690	20.1671	20.0816	19.7138	19.2546	18.9001 (93)

8. Space heating requirement												

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9976	0.9938	0.9819	0.9408	0.8318	0.6339	0.4440	0.5046	0.7929	0.9661	0.9947	0.9983 (94)
Ext temp.	520.9489	627.3666	724.3294	795.9079	763.8323	575.0515	384.3697	401.9272	569.3773	588.7745	517.6185	487.7734 (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	1640.0241	1588.2267	1436.4325	1193.6150	913.2476	602.8069	388.0542	408.7535	653.1439	1001.9065	1342.5500	1631.7466 (97)
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	832.5920	645.6980	529.8047	286.3492	111.1650	0.0000	0.0000	0.0000	0.0000	307.3703	593.9507	851.1160 (98)
Space heating												4158.0457 (98)
Space heating per m2	(98) / (4) =											43.4760 (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	1022.0524	804.5944	824.6460	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8842	0.9378	0.9140	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	903.7125	754.5137	753.6997	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1162.9226	1112.2259	1033.2519	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	186.6313	266.1379	207.9869	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												660.7560 (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	46.6578	66.5345	51.9967	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												165.1890 (107)
Space cooling per m2												1.7272 (108)
Energy for space heating												43.4760 (99)
Energy for space cooling												1.7272 (108)
Total												45.2032 (109)
Target Fabric Energy Efficiency (TFEE)												52.0 (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	47.8200 (1b)	x 2.3700 (2b)	= 113.3334 (1b) - (3b)
First floor	47.8200 (1c)	x 2.6200 (2c)	= 125.2884 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	95.6400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 238.6218 (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) = 0.1676 (8)
Pressure test					Yes
Measured/design AP50					4.5900
Infiltration rate					0.3971 (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) =	0.3673 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.9000	4.6000	4.5000	4.2000	4.2000	4.1000	4.1000	4.0000	4.0000	4.3000	4.3000	4.4000 (22)
Wind factor	1.2250	1.1500	1.1250	1.0500	1.0500	1.0250	1.0250	1.0000	1.0000	1.0750	1.0750	1.1000 (22a)
Adj infilt rate												
Effective ac	0.4500	0.4224	0.4133	0.3857	0.3857	0.3765	0.3765	0.3673	0.3673	0.3949	0.3949	0.4041 (22b)
	0.6012	0.5892	0.5854	0.5744	0.5744	0.5709	0.5709	0.5675	0.5675	0.5780	0.5780	0.5816 (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			2.0400	1.2000	2.4480		(26)
Windows (Uw = 1.40)			19.6300	1.3258	26.0379		(27)
Flr - Ground			47.8170	0.1800	8.6071	75.6000	3614.9652 (28a)
Wl - Brick (Timber Frame)	98.8910	21.6710	77.2200	0.2100	16.2162	7.4000	571.4280 (29a)
Rf - Ins Joist	47.8170		47.8170	0.0800	3.8254	7.4000	353.8458 (30)
Total net area of external elements Aum(A, m ²)			194.5340				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	57.1345		(33)
Party Wall			41.7120	0.0000	0.0000	7.4000	308.6688 (32)
Stud			75.3423			7.4000	557.5330 (32c)
Internal Floor			47.8170			7.4000	353.8458 (32d)
Internal Ceiling			47.8170			7.4000	353.8458 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 6114.1324 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							63.9286 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							19.5339 (36)
Total fabric heat loss							(33) + (36) = 76.6684 (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	47.3454	46.3991	46.0969	45.2302	45.2302	44.9546	44.9546	44.6856	44.6856	45.5125	45.5125	45.8013 (38)
Heat transfer coeff	124.0138	123.0675	122.7653	121.8986	121.8986	121.6230	121.6230	121.3540	121.3540	122.1809	122.1809	122.4697 (39)
Average = Sum(39)m / 12 =												122.2024 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2967	1.2868	1.2836	1.2746	1.2746	1.2717	1.2717	1.2689	1.2689	1.2775	1.2775	1.2805 (40)
HLP (average)												1.2777 (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												2.6953 (42)
Average daily hot water use (litres/day)												98.2141 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	108.0356	104.1070	100.1784	96.2499	92.3213	88.3927	88.3927	92.3213	96.2499	100.1784	104.1070	108.0356 (44)
Energy conte	160.2136	140.1239	144.5953	126.0617	120.9592	104.3786	96.7221	110.9900	112.3156	130.8930	142.8799	155.1583 (45)
Energy content (annual)												Total = Sum(45)m = 1545.2910 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

	24.0320	21.0186	21.6893	18.9092	18.1439	15.6568	14.5083	16.6485	16.8473	19.6339	21.4320	23.2738 (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	0.6707	0.6087	0.6507	0.5460	0.5025	0.4152	0.3847	0.4611	0.4865	0.5890	0.6206	0.6496 (61)
Total heat required for water heating calculated for each month	160.8844	140.7325	145.2459	126.6077	121.4617	104.7937	97.1068	111.4511	112.8020	131.4820	143.5005	155.8079 (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	160.8844	140.7325	145.2459	126.6077	121.4617	104.7937	97.1068	111.4511	112.8020	131.4820	143.5005	155.8079 (64)
RHI water heating demand												
Heat gains from water heating, kWh/month	53.4387	46.7433	48.2406	42.0520	40.3446	34.8097	32.2563	37.0195	37.4665	43.6692	47.6627	51.7525 (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	161.7200	161.7200	161.7200	161.7200	161.7200	161.7200	161.7200	161.7200	161.7200	161.7200	161.7200	161.7200 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.6457	49.4240	40.1943	30.4297	22.7466	19.2036	20.7502	26.9719	36.2016	45.9662	53.6493	57.1923 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	371.7619	375.6196	365.8982	345.2027	319.0782	294.5249	278.1218	274.2640	283.9854	304.6810	330.8054	355.3587 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.8673	53.8673	53.8673	53.8673	53.8673	53.8673	53.8673	53.8673	53.8673	53.8673	53.8673	53.8673 (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)	-107.8133	-107.8133	-107.8133	-107.8133	-107.8133	-107.8133	-107.8133	-107.8133	-107.8133	-107.8133	-107.8133	-107.8133 (71)
Water heating gains (Table 5)	71.8262	69.5586	64.8395	58.4056	54.2265	48.3468	43.3552	49.7573	52.0369	58.6951	66.1982	69.5599 (72)
Total internal gains	610.0078	605.3761	581.7061	544.8119	506.8253	472.8492	453.0011	461.7672	482.9978	520.1163	561.4270	592.8849 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d		Gains W	
North				7.1650	13.4684	0.7300	0.7200		0.7700		35.1497 (74)	
South				5.2480	56.5862	0.7300	0.7200		0.7700		108.1666 (78)	
West				7.2210	25.1733	0.7300	0.7200		0.7700		66.2103 (80)	
Solar gains	209.5265	318.2798	479.8785	657.6178	741.6696	834.7962	769.1906	697.6813	568.5555	395.2357	253.3132	174.2113 (83)
Total gains	819.5343	923.6560	1061.5846	1202.4297	1248.4949	1307.6454	1222.1917	1159.4485	1051.5533	915.3519	814.7402	767.0962 (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	13.6950	13.8003	13.8343	13.9326	13.9326	13.9642	13.9642	13.9952	13.9952	13.9005	13.9005	13.8677
alpha	1.9130	1.9200	1.9223	1.9288	1.9288	1.9309	1.9309	1.9330	1.9330	1.9267	1.9267	1.9245
util living area	0.8752	0.8462	0.7864	0.6909	0.5706	0.4078	0.3017	0.3069	0.5040	0.7062	0.8293	0.8846 (86)
MIT	18.3649	18.6405	19.2079	19.8771	20.4349	20.8035	20.9263	20.9266	20.6891	20.0620	19.1647	18.3396 (87)
Th 2	19.8434	19.8512	19.8537	19.8608	19.8608	19.8631	19.8631	19.8653	19.8653	19.8585	19.8585	19.8561 (88)
util rest of house	0.8605	0.8288	0.7620	0.6551	0.5170	0.3328	0.2065	0.2073	0.4271	0.6612	0.8061	0.8708 (89)
MIT 2	16.4691	16.8545	17.6416	18.5527	19.2797	19.7106	19.8281	19.8317	19.6022	18.8248	17.6029	16.4395 (90)
Living area fraction									fLA = Living area / (4)			0.1967 (91)
MIT	16.8420	17.2057	17.9496	18.8132	19.5069	19.9255	20.0440	20.0471	19.8160	19.0681	17.9101	16.8132 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.6920	17.0557	17.7996	18.6632	19.3569	19.7755	19.8940	19.8971	19.6660	18.9181	17.7601	16.6632 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.8051	0.7722	0.7075	0.6111	0.4906	0.3266	0.2092	0.2102	0.4122	0.6168	0.7499	0.8166 (94)
Useful gains	659.7686	713.2060	751.0264	734.8403	612.5421	427.1042	255.6727	243.7698	433.4128	564.6116	610.9506	626.4240 (95)
Ext temp.	5.7000	6.1000	7.7000	10.1000	13.1000	15.9000	17.7000	17.8000	15.5000	12.3000	8.8000	5.8000 (96)
Heat loss rate W	1363.1587	1348.2956	1239.8841	1043.8411	762.7061	471.3554	266.8469	254.4876	505.5595	808.6053	1094.7512	1330.4126 (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	523.3222	426.7802	363.7101	222.4806	111.7220	0.0000	0.0000	0.0000	0.0000	181.5313	348.3364	523.7675 (98)
Space heating												2701.6504 (98)
RHI space heating demand												2702 (98)

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	47.8200 (1b)	x 2.3700 (2b)	= 113.3334 (1b) - (3b)
First floor	47.8200 (1c)	x 2.6200 (2c)	= 125.2884 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	95.6400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 238.6218 (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) = 0.1676 (8)
Pressure test					Yes
Measured/design AP50					4.5900
Infiltration rate					0.3971 (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) =	0.3673 (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	0.4684	0.4592	0.4500	0.4041	0.3949	0.3490	0.3490	0.3398	0.3673	0.3949	0.4133	0.4316 (22b)
Effective ac	0.6097	0.6054	0.6012	0.5816	0.5780	0.5609	0.5609	0.5577	0.5675	0.5780	0.5854	0.5932 (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			2.0400	1.2000	2.4480		(26)
Windows (Uw = 1.40)			19.6300	1.3258	26.0379		(27)
Flr - Ground			47.8170	0.1800	8.6071	75.6000	3614.9652 (28a)
Wl - Brick (Timber Frame)	98.8910	21.6710	77.2200	0.2100	16.2162	7.4000	571.4280 (29a)
Rf - Ins Joist	47.8170		47.8170	0.0800	3.8254	7.4000	353.8458 (30)
Total net area of external elements Aum(A, m ²)			194.5340				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	57.1345		(33)
Party Wall			41.7120	0.0000	0.0000	7.4000	308.6688 (32)
Stud			75.3423			7.4000	557.5330 (32c)
Internal Floor			47.8170			7.4000	353.8458 (32d)
Internal Ceiling			47.8170			7.4000	353.8458 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 6114.1324 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							63.9286 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							19.5339 (36)
Total fabric heat loss							(33) + (36) = 76.6684 (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	48.0096	47.6742	47.3454	45.8013	45.5125	44.1676	44.1676	43.9185	44.6856	45.5125	46.0969	46.7079 (38)
Heat transfer coeff	124.6780	124.3426	124.0138	122.4697	122.1809	120.8360	120.8360	120.5869	121.3540	122.1809	122.7653	123.3763 (39)
Average = Sum(39)m / 12 =												122.4684 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3036	1.3001	1.2967	1.2805	1.2775	1.2634	1.2634	1.2608	1.2689	1.2775	1.2836	1.2900 (40)
HLP (average)												1.2805 (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												2.6953 (42)
Average daily hot water use (litres/day)												98.2141 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	108.0356	104.1070	100.1784	96.2499	92.3213	88.3927	88.3927	92.3213	96.2499	100.1784	104.1070	108.0356 (44)
Energy conte	160.2136	140.1239	144.5953	126.0617	120.9592	104.3786	96.7221	110.9900	112.3156	130.8930	142.8799	155.1583 (45)
Energy content (annual)												Total = Sum(45)m = 1545.2910 (45)
Distribution loss (46)m = 0.15 x (45)m												

Water storage loss:	24.0320	21.0186	21.6893	18.9092	18.1439	15.6568	14.5083	16.6485	16.8473	19.6339	21.4320	23.2738 (46)
Total storage loss												
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 (56)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Total heat required for water heating calculated for each month	0.6707	0.6087	0.6507	0.5460	0.5025	0.4152	0.3847	0.4611	0.4865	0.5890	0.6206	0.6496 (61)
WWHRS	160.8844	140.7325	145.2459	126.6077	121.4617	104.7937	97.1068	111.4511	112.8020	131.4820	143.5005	155.8079 (62)
Total of WWHRS savings	-52.8470	-46.4987	-47.4579	-39.0458	-36.2542	-29.9075	-25.3110	-30.6460	-31.5404	-38.9909	-45.1668	-51.0792 eq. (G10)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-474.7454
Output from w/h								Solar input	(sum of months) =	Sum(63)m =		0.0000 (63)
	108.0374	94.2338	97.7880	87.5619	85.2075	74.8862	71.7958	80.8051	81.2617	92.4911	98.3337	104.7287 (64)
Heat gains from water heating, kWh/month								Total per year	(kWh/year) =	Sum(64)m =		1077.1309 (65)
	53.4387	46.7433	48.2406	42.0520	40.3446	34.8097	32.2563	37.0195	37.4665	43.6692	47.6627	51.7525 (65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	161.7200	161.7200	161.7200	161.7200	161.7200	161.7200	161.7200	161.7200	161.7200	161.7200	161.7200	161.7200 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.6457	49.4240	40.1943	30.4297	22.7466	19.2036	20.7502	26.9719	36.2016	45.9662	53.6493	57.1923 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	371.7619	375.6196	365.8982	345.2027	319.0782	294.5249	278.1218	274.2640	283.9854	304.6810	330.8054	355.3587 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.8673	53.8673	53.8673	53.8673	53.8673	53.8673	53.8673	53.8673	53.8673	53.8673	53.8673	53.8673 (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)	-107.8133	-107.8133	-107.8133	-107.8133	-107.8133	-107.8133	-107.8133	-107.8133	-107.8133	-107.8133	-107.8133	-107.8133 (71)
Water heating gains (Table 5)	71.8262	69.5586	64.8395	58.4056	54.2265	48.3468	43.3552	49.7573	52.0369	58.6951	66.1982	69.5599 (72)
Total internal gains	610.0078	605.3761	581.7061	544.8119	506.8253	472.8492	453.0011	461.7672	482.9978	520.1163	561.4270	592.8849 (73)

[Jan	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W

North	7.1650	10.6334	0.7300	0.7200	0.7700	27.7509 (74)
South	5.2480	46.7521	0.7300	0.7200	0.7700	89.3682 (78)
West	7.2210	19.6403	0.7300	0.7200	0.7700	51.6575 (80)

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													3677.3985 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	611.3312	491.8534	434.7345	283.3456	165.1778	0.0000	0.0000	0.0000	0.0000	265.2860	444.0042	621.2806	(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)	677.7508	545.2920	481.9673	314.1304	183.1240	0.0000	0.0000	0.0000	0.0000	294.1087	492.2441	688.7812	(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	108.0374	94.2338	97.7880	87.5619	85.2075	74.8862	71.7958	80.8051	81.2617	92.4911	98.3337	104.7287	(64)
Efficiency of water heater (217)m	87.8177	87.6543	87.3042	86.5110	84.9766	76.4000	76.4000	76.4000	76.4000	86.1760	87.3396	87.9094	(216)
Fuel for water heating, kWh/month	123.0246	107.5061	112.0084	101.2147	100.2717	98.0186	93.9736	105.7659	106.3635	107.3281	112.5878	119.1325	(217)
Water heating fuel used												1287.1955	(219)
Annual totals kWh/year													
Space heating fuel - main system												3677.3985	(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)												393.0884	(232)
Total delivered energy for all uses												5432.6824	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3677.3985	3.4800	127.9735 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1287.1955	3.4800	44.7944 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	393.0884	13.1900	51.8484 (250)
Additional standing charges			120.0000 (251)
Total energy cost			354.5087 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.4200 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] = 1.0587 (257)
SAP value	85.2313
SAP rating (Section 12)	85 (258)
SAP band	B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3677.3985	0.2160	794.3181 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1287.1955	0.2160	278.0342 (264)
Space and water heating			1072.3523 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	393.0884	0.5190	204.0129 (268)
Total kg/year			1315.2902 (272)
CO2 emissions per m2			13.7500 (273)
EI value			87.4681
EI rating			87 (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	$3.48 / 0.8344 = 4.171$, stars = 5
Water heating environmental impact	$0.216 / 0.8344 = 0.2589$, 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	47.8200 (1b)	x 2.3700 (2b)	= 113.3334 (1b) - (3b)
First floor	47.8200 (1c)	x 2.6200 (2c)	= 125.2884 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	95.6400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 238.6218 (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) = 0.1676 (8)
Pressure test					Yes
Measured/design AP50					4.5900
Infiltration rate					0.3971 (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) =				0.3673 (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	0.4500	0.4224	0.4133	0.3857	0.3857	0.3765	0.3765	0.3673	0.3673	0.3949	0.3949	0.4041 (22b)
Effective ac	0.6012	0.5892	0.5854	0.5744	0.5744	0.5709	0.5709	0.5675	0.5675	0.5780	0.5780	0.5816 (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			2.0400	1.2000	2.4480		(26)
Windows (Uw = 1.40)			19.6300	1.3258	26.0379		(27)
Flr - Ground			47.8170	0.1800	8.6071	75.6000	3614.9652 (28a)
Wl - Brick (Timber Frame)	98.8910	21.6710	77.2200	0.2100	16.2162	7.4000	571.4280 (29a)
Rf - Ins Joist	47.8170		47.8170	0.0800	3.8254	7.4000	353.8458 (30)
Total net area of external elements Aum(A, m ²)			194.5340				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	57.1345		(33)
Party Wall			41.7120	0.0000	0.0000	7.4000	308.6688 (32)
Stud			75.3423			7.4000	557.5330 (32c)
Internal Floor			47.8170			7.4000	353.8458 (32d)
Internal Ceiling			47.8170			7.4000	353.8458 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 6114.1324 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 63.9286 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 19.5339 (36)
Total fabric heat loss (33) + (36) = 76.6684 (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	47.3454	46.3991	46.0969	45.2302	45.2302	44.9546	44.9546	44.6856	44.6856	45.5125	45.5125	45.8013 (38)
Heat transfer coeff	124.0138	123.0675	122.7653	121.8986	121.8986	121.6230	121.6230	121.3540	121.3540	122.1809	122.1809	122.4697 (39)
Average = Sum(39)m / 12 =												122.2024 (39)
HLP	1.2967	1.2868	1.2836	1.2746	1.2746	1.2717	1.2717	1.2689	1.2689	1.2775	1.2775	1.2805 (40)
HLP (average)												1.2777 (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												2.6953 (42)
Average daily hot water use (litres/day)												98.2141 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	108.0356	104.1070	100.1784	96.2499	92.3213	88.3927	88.3927	92.3213	96.2499	100.1784	104.1070	108.0356 (44)
Energy content (annual)	160.2136	140.1239	144.5953	126.0617	120.9592	104.3786	96.7221	110.9900	112.3156	130.8930	142.8799	155.1583 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1545.2910 (45)

Water storage loss:	24.0320	21.0186	21.6893	18.9092	18.1439	15.6568	14.5083	16.6485	16.8473	19.6339	21.4320	23.2738 (46)
Total storage loss												
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 (56)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Total heat required for water heating calculated for each month	0.6707	0.6087	0.6507	0.5460	0.5025	0.4152	0.3847	0.4611	0.4865	0.5890	0.6206	0.6496 (61)
WWHRS	160.8844	140.7325	145.2459	126.6077	121.4617	104.7937	97.1068	111.4511	112.8020	131.4820	143.5005	155.8079 (62)
Total of WWHRS savings	-52.8470	-46.4987	-47.4579	-39.0458	-36.2542	-29.9075	-25.3110	-30.6460	-31.5404	-38.9909	-45.1668	-51.0792 eq. (G10)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-474.7454
Output from w/h								Solar input	(sum of months) =	Sum(63)m =		0.0000 (63)
	108.0374	94.2338	97.7880	87.5619	85.2075	74.8862	71.7958	80.8051	81.2617	92.4911	98.3337	104.7287 (64)
Heat gains from water heating, kWh/month								Total per year	(kWh/year) =	Sum(64)m =		1077.1309 (65)
	53.4387	46.7433	48.2406	42.0520	40.3446	34.8097	32.2563	37.0195	37.4665	43.6692	47.6627	51.7525 (65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	161.7200	161.7200	161.7200	161.7200	161.7200	161.7200	161.7200	161.7200	161.7200	161.7200	161.7200	161.7200 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.6457	49.4240	40.1943	30.4297	22.7466	19.2036	20.7502	26.9719	36.2016	45.9662	53.6493	57.1923 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	371.7619	375.6196	365.8982	345.2027	319.0782	294.5249	278.1218	274.2640	283.9854	304.6810	330.8054	355.3587 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.8673	53.8673	53.8673	53.8673	53.8673	53.8673	53.8673	53.8673	53.8673	53.8673	53.8673	53.8673 (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)	-107.8133	-107.8133	-107.8133	-107.8133	-107.8133	-107.8133	-107.8133	-107.8133	-107.8133	-107.8133	-107.8133	-107.8133 (71)
Water heating gains (Table 5)	71.8262	69.5586	64.8395	58.4056	54.2265	48.3468	43.3552	49.7573	52.0369	58.6951	66.1982	69.5599 (72)
Total internal gains	610.0078	605.3761	581.7061	544.8119	506.8253	472.8492	453.0011	461.7672	482.9978	520.1163	561.4270	592.8849 (73)

[Jan	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	7.1650	13.4684	0.7300	0.7200	0.7700	35.1497 (74)
South	5.2480	56.5862	0.7300	0.7200	0.7700	108.1666 (78)
West	7.2210	25.1733	0.7300	0.7200	0.7700	66.2103 (80)

Space heating		2701.0504 (98)
Space heating per m2	(98) / (4) =	28.2481 (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													2995.1778 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	523.3222	426.7802	363.7101	222.4806	111.7220	0.0000	0.0000	0.0000	0.0000	181.5313	348.3364	523.7675	(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)	580.1799	473.1488	403.2263	246.6525	123.8604	0.0000	0.0000	0.0000	0.0000	201.2542	386.1823	580.6735	(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	108.0374	94.2338	97.7880	87.5619	85.2075	74.8862	71.7958	80.8051	81.2617	92.4911	98.3337	104.7287	(64)
Efficiency of water heater (217)m	87.4956	87.3464	86.8750	85.8220	83.6615	76.4000	76.4000	76.4000	76.4000	85.0167	86.7504	87.5644	(216)
Fuel for water heating, kWh/month	123.4775	107.8851	112.5618	102.0273	101.8479	98.0186	93.9736	105.7659	106.3635	108.7916	113.3525	119.6019	(219)
Water heating fuel used												1293.6672	(219)
Annual totals kWh/year													
Space heating fuel - main system												2995.1778	(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)													393.0884 (232)
Total delivered energy for all uses													4756.9333 (238)

10a. Fuel costs - using BEDF prices (535)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2995.1778	7.6100	227.9330 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1293.6672	7.6100	98.4481 (247)
Pumps and fans for heating	75.0000	31.0800	23.3100 (249)
Energy for lighting	393.0884	31.0800	122.1719 (250)
Additional standing charges			105.0000 (251)
Total energy cost			576.8630 (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	2995.1778	0.2160	646.9584 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1293.6672	0.2160	279.4321 (264)
Space and water heating			926.3905 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	393.0884	0.5190	204.0129 (268)
Total kg/year			1169.3284 (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	2995.1778	1.2200	3654.1169 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1293.6672	1.2200	1578.2740 (264)
Space and water heating			5232.3909 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	393.0884	3.0700	1206.7813 (268)
Primary energy kWh/year			6669.4221 (272)
Primary energy kWh/m2/year			69.7347 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:
Current environmental impact rating:

B 85
B 87

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	+ 9.5	-£ 605	-1010 kg (86.4%)
Measures omitted - SAP change or cost saving too small:			
N Solar water heating	+ 0.9	-£ 46	-148 kg (12.7%)

Recommended measures	Typical annual savings		Energy efficiency	Environmental impact
Solar photovoltaic panels	£605	10.56 kg/m²	A 95	A 96
Total Savings	£605	10.56 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 535 TEST (04 Jan 2024)
Recommendation texts revision number 4.9c (22 Feb 2014)

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

	Current	Potential	Saving
Electricity	£145	£145	£0
Mains gas	£431	£431	£0
Space heating	£356	£356	£0
Water heating	£98	£98	£0
Lighting	£122	£122	£0
Generated (PV)	-£0	-£605	£605
Total cost of fuels	£576	-£29	£605
Total cost of uses	£576	-£29	£605
Delivered energy	50 kWh/m²	29 kWh/m²	20 kWh/m²
Carbon dioxide emissions	1.2 tonnes	0.2 tonnes	1.0 tonnes
CO2 emissions per m²	12 kg/m²	2 kg/m²	11 kg/m²
Primary energy	70 kWh/m²	7 kWh/m²	62 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	47.8200 (1b)	x 2.3700 (2b)	= 113.3334 (1b) - (3b)
First floor	47.8200 (1c)	x 2.6200 (2c)	= 125.2884 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	95.6400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 238.6218 (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) = 0.1676 (8)
Pressure test					Yes
Measured/design AP50					4.5900
Infiltration rate					0.3971 (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) =	0.3673 (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	0.4684	0.4592	0.4500	0.4041	0.3949	0.3490	0.3490	0.3398	0.3673	0.3949	0.4133	0.4316 (22b)
Effective ac	0.6097	0.6054	0.6012	0.5816	0.5780	0.5609	0.5609	0.5577	0.5675	0.5780	0.5854	0.5932 (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			2.0400	1.2000	2.4480		(26)
Windows (Uw = 1.40)			19.6300	1.3258	26.0379		(27)
Flr - Ground			47.8170	0.1800	8.6071	75.6000	3614.9652 (28a)
Wl - Brick (Timber Frame)	98.8910	21.6710	77.2200	0.2100	16.2162	7.4000	571.4280 (29a)
Rf - Ins Joist	47.8170		47.8170	0.0800	3.8254	7.4000	353.8458 (30)
Total net area of external elements Aum(A, m ²)			194.5340				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	57.1345		(33)
Party Wall			41.7120	0.0000	0.0000	7.4000	308.6688 (32)
Stud			75.3423			7.4000	557.5330 (32c)
Internal Floor			47.8170			7.4000	353.8458 (32d)
Internal Ceiling			47.8170			7.4000	353.8458 (32e)

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

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	48.0096	47.6742	47.3454	45.8013	45.5125	44.1676	44.1676	43.9185	44.6856	45.5125	46.0969	46.7079 (38)
Heat transfer coeff	124.6780	124.3426	124.0138	122.4697	122.1809	120.8360	120.8360	120.5869	121.3540	122.1809	122.7653	123.3763 (39)
Average = Sum(39)m / 12 =												122.4684 (39)
HLP	1.3036	1.3001	1.2967	1.2805	1.2775	1.2634	1.2634	1.2608	1.2689	1.2775	1.2836	1.2900 (40)
HLP (average)												1.2805 (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												2.6953 (42)
Average daily hot water use (litres/day)												98.2141 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	108.0356	104.1070	100.1784	96.2499	92.3213	88.3927	88.3927	92.3213	96.2499	100.1784	104.1070	108.0356 (44)
Energy conte	160.2136	140.1239	144.5953	126.0617	120.9592	104.3786	96.7221	110.9900	112.3156	130.8930	142.8799	155.1583 (45)
Energy content (annual)										Total = Sum(45)m =		1545.2910 (45)
Distribution loss (46)m = 0.15 x (45)m												

Water storage loss:	24.0320	21.0186	21.6893	18.9092	18.1439	15.6568	14.5083	16.6485	16.8473	19.6339	21.4320	23.2738 (46)
Total storage loss												
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 (56)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Total heat required for water heating calculated for each month	0.6707	0.6087	0.6507	0.5460	0.5025	0.4152	0.3847	0.4611	0.4865	0.5890	0.6206	0.6496 (61)
WWHRS	160.8844	140.7325	145.2459	126.6077	121.4617	104.7937	97.1068	111.4511	112.8020	131.4820	143.5005	155.8079 (62)
Total of WWHRS savings	-52.8470	-46.4987	-47.4579	-39.0458	-36.2542	-29.9075	-25.3110	-30.6460	-31.5404	-38.9909	-45.1668	-51.0792 eq. (G10)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-474.7454
Output from w/h								Solar input	(sum of months) =	Sum(63)m =		0.0000 (63)
	108.0374	94.2338	97.7880	87.5619	85.2075	74.8862	71.7958	80.8051	81.2617	92.4911	98.3337	104.7287 (64)
Heat gains from water heating, kWh/month								Total per year	(kWh/year) =	Sum(64)m =		1077.1309 (65)
	53.4387	46.7433	48.2406	42.0520	40.3446	34.8097	32.2563	37.0195	37.4665	43.6692	47.6627	51.7525 (65)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8341	0.7956	0.7411	0.6592	0.5546	0.4276	0.3110	0.3441	0.5152	0.6905	0.7968	0.8454 (94)
Useful gains	649.5850	720.6906	759.3634	753.4819	675.9629	512.0021	355.8359	366.7771	504.6729	594.5532	610.3888	621.9995 (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	1471.2668	1452.6153	1343.6840	1147.0175	897.9761	603.7228	388.9883	408.5040	642.5115	951.1204	1227.0613	1457.0541 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	611.3312	491.8534	434.7345	283.3456	165.1778	0.0000	0.0000	0.0000	0.0000	265.2860	444.0042	621.2806 (98)
Space heating												3317.0135 (98)
Space heating per m2												34.6823 (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													3677.3985 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	611.3312	491.8534	434.7345	283.3456	165.1778	0.0000	0.0000	0.0000	0.0000	265.2860	444.0042	621.2806	(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)	677.7508	545.2920	481.9673	314.1304	183.1240	0.0000	0.0000	0.0000	0.0000	294.1087	492.2441	688.7812	(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	108.0374	94.2338	97.7880	87.5619	85.2075	74.8862	71.7958	80.8051	81.2617	92.4911	98.3337	104.7287	(64)
Efficiency of water heater (217)m	87.8177	87.6543	87.3042	86.5110	84.9766	76.4000	76.4000	76.4000	76.4000	86.1760	87.3396	87.9094	(216)
Fuel for water heating, kWh/month	123.0246	107.5061	112.0084	101.2147	100.2717	98.0186	93.9736	105.7659	106.3635	107.3281	112.5878	119.1325	(219)
Water heating fuel used												1287.1955	(219)
Annual totals kWh/year													
Space heating fuel - main system													3677.3985 (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)													393.0884 (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													3705.4430 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3677.3985	3.4800	127.9735 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1287.1955	3.4800	44.7944 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	393.0884	13.1900	51.8484 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-1727.2394	13.1900	-227.8229 (252)
Total energy cost			126.6859 (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] =	0.3783 (257)
SAP value		94.7223
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	3677.3985	0.2160	794.3181 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1287.1955	0.2160	278.0342 (264)
Space and water heating			1072.3523 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	393.0884	0.5190	204.0129 (268)
Energy saving/generation technologies			
PV Unit	-1727.2394	0.5190	-896.4372 (269)
Total kg/year			418.8529 (272)
CO2 emissions per m2			4.3800 (273)
EI value			96.0092
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	47.8200 (1b)	x 2.3700 (2b)	= 113.3334 (1b) - (3b)
First floor	47.8200 (1c)	x 2.6200 (2c)	= 125.2884 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	95.6400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 238.6218 (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) = 0.1676 (8)
Pressure test					Yes
Measured/design AP50					4.5900
Infiltration rate					0.3971 (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) =				0.3673 (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	0.4500	0.4224	0.4133	0.3857	0.3857	0.3765	0.3765	0.3673	0.3673	0.3949	0.3949	0.4041 (22b)
Effective ac	0.6012	0.5892	0.5854	0.5744	0.5744	0.5709	0.5709	0.5675	0.5675	0.5780	0.5780	0.5816 (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			2.0400	1.2000	2.4480		(26)
Windows (Uw = 1.40)			19.6300	1.3258	26.0379		(27)
Flr - Ground			47.8170	0.1800	8.6071	75.6000	3614.9652 (28a)
Wl - Brick (Timber Frame)	98.8910	21.6710	77.2200	0.2100	16.2162	7.4000	571.4280 (29a)
Rf - Ins Joist	47.8170		47.8170	0.0800	3.8254	7.4000	353.8458 (30)
Total net area of external elements Aum(A, m ²)			194.5340				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	57.1345		(33)
Party Wall			41.7120	0.0000	0.0000	7.4000	308.6688 (32)
Stud			75.3423			7.4000	557.5330 (32c)
Internal Floor			47.8170			7.4000	353.8458 (32d)
Internal Ceiling			47.8170			7.4000	353.8458 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 6114.1324 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							63.9286 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							19.5339 (36)
Total fabric heat loss							(33) + (36) = 76.6684 (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	47.3454	46.3991	46.0969	45.2302	45.2302	44.9546	44.9546	44.6856	44.6856	45.5125	45.5125	45.8013 (38)
Heat transfer coeff	124.0138	123.0675	122.7653	121.8986	121.8986	121.6230	121.6230	121.3540	121.3540	122.1809	122.1809	122.4697 (39)
Average = Sum(39)m / 12 =												122.2024 (39)
HLP	1.2967	1.2868	1.2836	1.2746	1.2746	1.2717	1.2717	1.2689	1.2689	1.2775	1.2775	1.2805 (40)
HLP (average)												1.2777 (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												2.6953 (42)
Average daily hot water use (litres/day)												98.2141 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	108.0356	104.1070	100.1784	96.2499	92.3213	88.3927	88.3927	92.3213	96.2499	100.1784	104.1070	108.0356 (44)
Energy conte	160.2136	140.1239	144.5953	126.0617	120.9592	104.3786	96.7221	110.9900	112.3156	130.8930	142.8799	155.1583 (45)
Energy content (annual)												Total = Sum(45)m = 1545.2910 (45)
Distribution loss (46)m = 0.15 x (45)m												

Water storage loss:	24.0320	21.0186	21.6893	18.9092	18.1439	15.6568	14.5083	16.6485	16.8473	19.6339	21.4320	23.2738 (46)
Total storage loss												
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 (56)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Total heat required for water heating calculated for each month	0.6707	0.6087	0.6507	0.5460	0.5025	0.4152	0.3847	0.4611	0.4865	0.5890	0.6206	0.6496 (61)
WWHRS	160.8844	140.7325	145.2459	126.6077	121.4617	104.7937	97.1068	111.4511	112.8020	131.4820	143.5005	155.8079 (62)
Total of WWHRS savings	-52.8470	-46.4987	-47.4579	-39.0458	-36.2542	-29.9075	-25.3110	-30.6460	-31.5404	-38.9909	-45.1668	-51.0792 eq. (G10)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-474.7454
Output from w/h								Solar input	(sum of months) =	Sum(63)m =		0.0000 (63)
	108.0374	94.2338	97.7880	87.5619	85.2075	74.8862	71.7958	80.8051	81.2617	92.4911	98.3337	104.7287 (64)
Heat gains from water heating, kWh/month								Total per year	(kWh/year) =	Sum(64)m =		1077.1309 (65)
	53.4387	46.7433	48.2406	42.0520	40.3446	34.8097	32.2563	37.0195	37.4665	43.6692	47.6627	51.7525 (65)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8051	0.7722	0.7075	0.6111	0.4906	0.3266	0.2092	0.2102	0.4122	0.6168	0.7499	0.8166 (94)
Useful gains	659.7686	713.2060	751.0264	734.8403	612.5421	427.1042	255.6727	243.7698	433.4128	564.6116	610.9506	626.4240 (95)
Ext temp.	5.7000	6.1000	7.7000	10.1000	13.1000	15.9000	17.7000	17.8000	15.5000	12.3000	8.8000	5.8000 (96)
Heat loss rate W	1363.1587	1348.2956	1239.8841	1043.8411	762.7061	471.3554	266.8469	254.4876	505.5595	808.6053	1094.7512	1330.4126 (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	523.3222	426.7802	363.7101	222.4806	111.7220	0.0000	0.0000	0.0000	0.0000	181.5313	348.3364	523.7675 (98)
Space heating												2701.6504 (98)
Space heating per m2												28.2481 (99)
										(98) / (4) =		

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													2995.1778 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	523.3222	426.7802	363.7101	222.4806	111.7220	0.0000	0.0000	0.0000	0.0000	181.5313	348.3364	523.7675	(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)	580.1799	473.1488	403.2263	246.6525	123.8604	0.0000	0.0000	0.0000	0.0000	201.2542	386.1823	580.6735	(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	108.0374	94.2338	97.7880	87.5619	85.2075	74.8862	71.7958	80.8051	81.2617	92.4911	98.3337	104.7287	(64)
Efficiency of water heater (217)m	87.4956	87.3464	86.8750	85.8220	83.6615	76.4000	76.4000	76.4000	76.4000	85.0167	86.7504	87.5644	(216)
Fuel for water heating, kWh/month	123.4775	107.8851	112.5618	102.0273	101.8479	98.0186	93.9736	105.7659	106.3635	108.7916	113.3525	119.6019	(219)
Water heating fuel used												1293.6672	(219)
Annual totals kWh/year													
Space heating fuel - main system												2995.1778	(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)													393.0884 (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												2810.4874	(238)

10a. Fuel costs - using BEDF prices (535)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2995.1778	7.6100	227.9330 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1293.6672	7.6100	98.4481 (247)
Pumps and fans for heating	75.0000	31.0800	23.3100 (249)
Energy for lighting	393.0884	31.0800	122.1719 (250)
Additional standing charges			105.0000 (251)
Energy saving/generation technologies			
PV Unit	-1946.4459	31.0800	-604.9554 (252)
Total energy cost			-28.0924 (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	2995.1778	0.2160	646.9584 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1293.6672	0.2160	279.4321 (264)
Space and water heating			926.3905 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	393.0884	0.5190	204.0129 (268)
Energy saving/generation technologies			
PV Unit	-1946.4459	0.5190	-1010.2054 (269)
Total kg/year			159.1229 (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	2995.1778	1.2200	3654.1169 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1293.6672	1.2200	1578.2740 (264)
Space and water heating			5232.3909 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	393.0884	3.0700	1206.7813 (268)
Energy saving/generation technologies			
PV Unit	-1946.4459	3.0700	-5975.5890 (269)
Primary energy kWh/year			693.8331 (272)
Primary energy kWh/m2/year			7.2546 (273)

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Built)

Property Reference	042 - PRJ013014				Issued on Date	11/01/2024
Assessment Reference	042			Prop Type Ref	D	
Property	23 Deeble Way, Netley Abbey, Southampton, SO31 5JP					
SAP Rating	85 B		DER	14.62	TER	17.38
Environmental	87 B		% DER<TER	15.87		
CO ₂ Emissions (t/year)	1.17		DFEE	47.19	TFEE	51.98
General Requirements Compliance	Pass		% DFEE<TFEE	9.22		
Assessor Details	Mr. Christopher Nicholls, Briary Energy Limited, Tel: 0203 397 1373, chris@briaryenergy.co.uk				Assessor ID	U903-0001
Client						

SUMMARY FOR INPUT DATA FOR New Build (As Built)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	17.38	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.62	kgCO ₂ /m ²	Pass
	-2.76 (-15.9%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	51.98	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	47.19	kWh/m ² /yr	
	-4.8 (-9.2%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.21 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.18 (max. 0.25)	0.18 (max. 0.70)	Pass
Roof	0.08 (max. 0.20)	0.08 (max. 0.35)	Pass
Openings	1.38 (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	4.59 (measured in this dwelling)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Built)

Main heating system

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

Pass

Secondary heating system

None

5 Cylinder insulation

Hot water storage

No cylinder

6 Controls

Space heating controls

Time and temperature zone control

Pass

Hot water controls

No cylinder

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100

%

Minimum

75

%

Pass

8 Mechanical ventilation

Not applicable

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Southern England)

Slight

Pass

Based on:

Overshading

Average

Windows facing North

7.17 m², No overhang

Windows facing South

5.25 m², No overhang

Windows facing West

7.22 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

4.59 (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