

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

Property Reference	011 - PRJ013014			Issued on Date	11/01/2024
Assessment Reference	011	Prop Type Ref	D		
Property	21 Deeble Way, Netley Abbey, Southampton, SO31 5JP				
SAP Rating	85 B	DER	14.50	TER	17.11
Environmental	88 B	% DER<TER	15.24		
CO ₂ Emissions (t/year)	1.16	DFEE	46.65	TFEE	50.64
General Requirements Compliance	Pass	% DFEE<TFEE	7.87		
Assessor Details	Mr. Christopher Nicholls, Briary Energy Limited, Tel: 0203 397 1373, chris@briaryenergy.co.uk			Assessor ID	U903-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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DWELLING AS BUILT

Semi-Detached 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) 17.11 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 14.50 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 50.6 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 46.6 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: 4.82 (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: 5.25 m², No overhang
Windows facing South: 7.17 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	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																4 * 10 =	40.0000 (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) =					40.0000 / (5) =	0.1676 (8)	
Pressure test															Yes		
Measured/design AP50															4.8200		
Infiltration rate															0.4086 (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) =					0.3780 (21)		
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec					
Wind factor	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)					
Adj infilt rate	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)					
	0.4819	0.4725	0.4630	0.4158	0.4063	0.3591	0.3591	0.3496	0.3780	0.4063	0.4252	0.4441 (22b)					
Effective ac	0.6161	0.6116	0.6072	0.5864	0.5826	0.5645	0.5645	0.5611	0.5714	0.5826	0.5904	0.5986 (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					
Solid Door			2.0400	1.2000	2.4480			(26)				
Windows (Uw = 1.40)			19.6300	1.3258	26.0379			(27)				
Flr - Ground			47.8200	0.1800	8.6076	75.6000	3615.1920	(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, m2)			194.5370					(31)				
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	57.1350			(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) = 6114.3592 (34)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								63.9310 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								19.5339 (36)				
Total fabric heat loss								(33) + (36) = 76.6689 (37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	48.5170	48.1619	47.8139	46.1791	45.8732	44.4493	44.4493	44.1856	44.9978	45.8732	46.4920	47.1389 (38)
Heat transfer coeff	125.1860	124.8309	124.4828	122.8480	122.5421	121.1183	121.1183	120.8546	121.6667	122.5421	123.1609	123.8078 (39)
Average = Sum(39)m / 12 =												122.8465 (39)
HLP	Jan 1.3089	Feb 1.3052	Mar 1.3016	Apr 1.2845	May 1.2813	Jun 1.2664	Jul 1.2664	Aug 1.2636	Sep 1.2721	Oct 1.2813	Nov 1.2878	Dec 1.2945 (40)
HLP (average)												1.2845 (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												

	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)
WWHRS	-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)
Total of WWHRS savings												-474.7454
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)
								Solar input	(sum of months) =	Sum(63)m =		0.0000 (63)
Output from w/h												
	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)
								Total per year	(kWh/year) =	Sum(64)m =		1077.1309 (64)
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)

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	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	409.5950	407.4233	392.4990	368.2932	343.5375	319.7899	304.4268	310.7330	323.2177	347.6478	375.7276	396.9571 (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	5.2480	10.6334	0.7300	0.7200	0.7700	20.3261 (74)
South	7.1650	46.7521	0.7300	0.7200	0.7700	122.0129 (78)
West	7.2210	19.6403	0.7300	0.7200	0.7700	51.6575 (80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8776	0.8346	0.7773	0.6947	0.5901	0.4625	0.3412	0.3767	0.5541	0.7338	0.8423	0.8890 (94)
Useful gains	529.7228	623.5352	683.6209	697.9923	639.3868	492.8510	347.6785	356.6570	477.6306	535.1648	513.6753	499.4569 (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	1424.7905	1415.2897	1315.1864	1126.8366	885.7380	597.8921	386.7848	405.6080	633.4638	928.4598	1188.9584	1409.2557 (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	665.9303	532.0590	469.8847	308.7680	183.2853	0.0000	0.0000	0.0000	0.0000	292.6115	486.2038	676.8903 (98)
Space heating												3615.6330 (98)
Space heating per m2											(98) / (4) =	37.8046 (99)

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Calculation Type: New Build (As Built)

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													4008.4623 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	665.9303	532.0590	469.8847	308.7680	183.2853	0.0000	0.0000	0.0000	0.0000	292.6115	486.2038	676.8903	(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)	738.2820	589.8659	520.9365	342.3148	203.1987	0.0000	0.0000	0.0000	0.0000	324.4030	539.0286	750.4327	(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	87.9817	87.8134	87.4781	86.7386	85.3098	76.4000	76.4000	76.4000	76.4000	86.4496	87.5400	88.0685	(216)
Fuel for water heating, kWh/month	122.7954	107.3114	111.7858	100.9492	99.8801	98.0186	93.9736	105.7659	106.3635	106.9884	112.3301	118.9172	(219)
Water heating fuel used												1285.0790	(219)
Annual totals kWh/year													
Space heating fuel - main system												4008.4623	(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												5761.6296	(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	4008.4623	0.2160	865.8279 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1285.0790	0.2160	277.5771 (264)
Space and water heating			1143.4049 (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			1386.3428 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			14.5000 (273)

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

DER			14.5000 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			31.8535 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			31.8535 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 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					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 m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.0400	1.0000	2.0400		(26)
TER Opening Type (Uw = 1.40)			19.6300	1.3258	26.0379		(27)
Flr - Ground			47.8200	0.1300	6.2166		(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, m ²)			194.5370				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	54.4103		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.6545 (36)
Total fabric heat loss						(33) + (36) =	65.0648 (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	47.1035	46.8033	46.5091	45.1269	44.8684	43.6646	43.6646	43.4417	44.1283	44.8684	45.3915	45.9384 (38)
Heat transfer coeff	112.1683	111.8681	111.5738	110.1917	109.9331	108.7294	108.7294	108.5064	109.1930	109.9331	110.4563	111.0032 (39)
Average = Sum(39)m / 12 =												110.1905 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1728	1.1697	1.1666	1.1522	1.1494	1.1369	1.1369	1.1345	1.1417	1.1494	1.1549	1.1606 (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												
	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												

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Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Total heat required for water heating calculated for each month	50.9589	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			5.2480		10.6334		0.6300		0.7000		0.7700		17.0544 (74)
South			7.1650		46.7521		0.6300		0.7000		0.7700		102.3738 (78)
West			7.2210		19.6403		0.6300		0.7000		0.7700		43.3428 (80)
Solar gains	162.7710	285.0414	408.5863	533.9859	620.9450	625.8395	599.5192	533.6456	452.0864	320.2432	196.4300	138.3208	(83)
Total gains	589.3119	709.4042	818.0247	918.5969	980.1418	960.6375	918.9704	860.0554	791.6476	684.8560	589.1117	552.2323	(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	59.2116	59.3705	59.5271	60.2737	60.4155	61.0844	61.0844	61.2099	60.8250	60.4155	60.1294	59.8331	
alpha	4.9474	4.9580	4.9685	5.0182	5.0277	5.0723	5.0723	5.0807	5.0550	5.0277	5.0086	4.9889	
util living area	0.9978	0.9940	0.9830	0.9463	0.8512	0.6791	0.5113	0.5644	0.8135	0.9681	0.9949	0.9984	(86)
MIT	19.7432	19.9277	20.2034	20.5445	20.8153	20.9572	20.9916	20.9865	20.8924	20.5283	20.0687	19.7127	(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	0.9970	0.9920	0.9770	0.9271	0.8007	0.5878	0.3966	0.4464	0.7359	0.9528	0.9928	0.9978	(89)
MIT 2	18.2704	18.5409	18.9416	19.4309	19.7833	19.9431	19.9678	19.9673	19.8833	19.4190	18.7561	18.2327	(90)
Living area fraction	18.5600	18.8137	19.1897	19.6499	19.9863	20.1425	20.1692	20.1678	20.0818	19.6372	19.0143	18.5238	(91)
MIT	18.5600	18.8137	19.1897	19.6499	19.9863	20.1425	20.1692	20.1678	20.0818	19.6372	19.0143	18.5238	(92)
Temperature adjustment	18.5600	18.8137	19.1897	19.6499	19.9863	20.1425	20.1692	20.1678	20.0818	19.6372	19.0143	18.5238	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9955	0.9888	0.9713	0.9200	0.8021	0.6040	0.4192	0.4696	0.7457	0.9465	0.9901	0.9967	(94)
Ext temp.	586.6421	701.4834	794.5096	845.1178	786.2059	580.2157	385.2309	403.8719	590.3261	648.1829	583.2560	550.3858	(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	1599.5222	1556.4956	1415.8412	1184.5536	910.9356	602.6332	388.0751	408.8284	653.1701	993.4879	1316.0078	1589.9858	(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	753.5828	574.5682	462.2707	244.3938	92.7989	0.0000	0.0000	0.0000	0.0000	256.9069	527.5813	773.4624	(98)
Space heating per m2												3685.5650	(98)
												38.5358	(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												3946.0011 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	753.5828	574.5682	462.2707	244.3938	92.7989	0.0000	0.0000	0.0000	0.0000	256.9069	527.5813	773.4624 (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)	806.8339	615.1693	494.9365	261.6636	99.3564	0.0000	0.0000	0.0000	0.0000	275.0609	564.8622	828.1182 (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	87.9779	87.7007	87.1417	85.9132	83.6244	80.3000	80.3000	80.3000	80.3000	85.9208	87.4625	80.3000 (216)
Fuel for water heating, kWh/month	240.0292	212.2574	224.4094	201.9799	200.9044	184.2709	176.5455	196.8069	198.9804	211.6505	219.7455	234.0401 (219)
Water heating fuel used												2501.6199 (219)
Annual totals kWh/year												
Space heating fuel - main system												3946.0011 (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												6916.5576 (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	3946.0011	0.2160	852.3362 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2501.6199	0.2160	540.3499 (264)
Space and water heating			1392.6861 (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			1636.0643 (272)
Emissions per m2 for space and water heating			14.5618 (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) = (14.5618 * 1.00) + 2.1377 + 0.4070, rounded to 2 d.p.			17.1100 (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	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) = 0.1257 (8)
Pressure test					Yes
Measured/design AP50					4.8200
Infiltration rate					0.3667 (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) =				0.3392 (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	0.4325	0.4240	0.4155	0.3731	0.3647	0.3223	0.3223	0.3138	0.3392	0.3647	0.3816	0.3986 (22b)
Effective ac	0.5935	0.5899	0.5863	0.5696	0.5665	0.5519	0.5519	0.5492	0.5575	0.5665	0.5728	0.5794 (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			47.8200	0.1800	8.6076	75.6000	3615.1920 (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)			194.5370				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	57.1350		(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) =		6114.3592 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							63.9310 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							19.5339 (36)
Total fabric heat loss					(33) + (36) =		76.6689 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	46.7376	46.4516	46.1713	44.8546	44.6082	43.4614	43.4614	43.2491	43.9032	44.6082	45.1066	45.6276 (38)
Heat transfer coeff	123.4065	123.1205	122.8402	121.5235	121.2772	120.1304	120.1304	119.9180	120.5721	121.2772	121.7755	122.2965 (39)
Average = Sum(39)m / 12 =												121.5223 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2903	1.2873	1.2844	1.2706	1.2681	1.2561	1.2561	1.2538	1.2607	1.2681	1.2733	1.2787 (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 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				5.2480	10.6334	0.7300	0.7200	0.7700	20.3261 (74)			
South				7.1650	46.7521	0.7300	0.7200	0.7700	122.0129 (78)			
West				7.2210	19.6403	0.7300	0.7200	0.7700	51.6575 (80)			

Solar gains	193.9964	339.7228	486.9681	636.4240	740.0651	745.8985	714.5290	636.0185	538.8132	381.6776	234.1125	164.8558 (83)
Total gains	574.5251	718.8976	852.9267	980.5173	1060.9243	1045.1478	1000.2262	925.6949	840.1427	705.0157	582.8113	533.5691 (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	13.7629	13.7949	13.8264	13.9762	14.0046	14.1383	14.1383	14.1633	14.0865	14.0046	13.9472	13.8878	
alpha	1.9175	1.9197	1.9218	1.9317	1.9336	1.9426	1.9426	1.9442	1.9391	1.9336	1.9298	1.9259	
util living area	0.9362	0.9041	0.8568	0.7809	0.6791	0.5555	0.4432	0.4834	0.6565	0.8250	0.9124	0.9437	(86)
MIT	17.5898	18.0129	18.6418	19.4081	20.0786	20.5721	20.8062	20.7629	20.3638	19.4630	18.3807	17.5091	(87)
Th 2	19.8484	19.8508	19.8531	19.8639	19.8659	19.8754	19.8754	19.8772	19.8718	19.8659	19.8618	19.8575	(88)
util rest of house	0.9285	0.8929	0.8397	0.7537	0.6362	0.4891	0.3517	0.3924	0.5962	0.7970	0.9002	0.9369	(89)
MIT 2	16.7466	17.1628	17.7784	18.5236	19.1527	19.5969	19.7807	19.7548	19.4292	18.5954	17.5392	16.6729	(90)
Living area fraction									fLA = Living area / (4) =			0.1967	(91)
MIT	16.9124	17.3300	17.9482	18.6976	19.3348	19.7887	19.9824	19.9531	19.6130	18.7660	17.7047	16.8373	(92)
Temperature adjustment												0.0000	
adjusted MIT	16.9124	17.3300	17.9482	18.6976	19.3348	19.7887	19.9824	19.9531	19.6130	18.7660	17.7047	16.8373	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9013	0.8603	0.8040	0.7206	0.6135	0.4835	0.3611	0.3991	0.5804	0.7633	0.8691	0.9116	(94)
Ext temp.	517.8126	618.4543	685.7599	706.5386	650.8365	505.3639	361.2132	369.4386	487.6015	538.1574	506.5233	486.4127	(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	1556.4566	1530.3920	1406.3034	1190.6376	925.9313	623.3171	406.3283	426.0816	664.7156	990.3510	1291.3938	1545.5039	(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	772.7512	612.8222	536.0844	348.5512	204.6705	0.0000	0.0000	0.0000	0.0000	336.4321	565.1068	787.9639	(98)
Space heating per m2												4164.3822	(98)
										(98) / (4) =		43.5423	(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	1129.2254	888.9647	911.3767	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7112	0.7690	0.7423	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	803.1005	683.6287	676.5503	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	1324.1381	1269.4353	1184.1089	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	375.1471	435.8401	377.6236	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												1188.6107 (104)
Cooled fraction									fC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	93.7868	108.9600	94.4059	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												297.1527 (107)
Space cooling per m2												3.1070 (108)
Energy for space heating												43.5423 (99)
Energy for space cooling												3.1070 (108)
Total												46.6493 (109)
Dwelling Fabric Energy Efficiency (DFEE)												46.6 (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 heating	secondary heating	other	total	m3 per hour			
Number of chimneys										0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues										0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans																3 * 10 =	30.0000 (7a)
Number of passive vents																0 * 10 =	0.0000 (7b)
Number of flueless gas fires																0 * 40 =	0.0000 (7c)
										Air changes per hour							
Infiltration due to chimneys, flues and fans										= (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000	/ (5) =	0.1257 (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			47.8200	0.1300	6.2166		(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)			194.5370				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	54.4103		(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) =	65.0648 (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	112.1683	111.8681	111.5738	110.1917	109.9331	108.7294	108.7294	108.5064	109.1930	109.9331	110.4563	111.0032 (39)
Average = Sum(39)m / 12 =												110.1905 (39)
HLP	Jan 1.1728	Feb 1.1697	Mar 1.1666	Apr 1.1522	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												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (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 (46)
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	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	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	380.5767	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 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	5.2480	10.6334	0.6300	0.7000	0.7700	17.0544	(74)
South	7.1650	46.7521	0.6300	0.7000	0.7700	102.3738	(78)
West	7.2210	19.6403	0.6300	0.7000	0.7700	43.3428	(80)

Solar gains	162.7710	285.0414	408.5863	533.9859	620.9450	625.8395	599.5192	533.6456	452.0864	320.2432	196.4300	138.3208	(83)
Total gains	543.3477	664.2588	774.5796	878.1055	941.8238	925.1054	885.2343	823.3453	753.4472	643.6210	545.1751	507.0835	(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	59.2116	59.3705	59.5271	60.2737	60.4155	61.0844	61.0844	61.2099	60.8250	60.4155	60.1294	59.8331	
alpha	4.9474	4.9580	4.9685	5.0182	5.0277	5.0723	5.0723	5.0807	5.0550	5.0277	5.0086	4.9889	
util living area	0.9984	0.9955	0.9864	0.9543	0.8664	0.6987	0.5292	0.5865	0.8348	0.9749	0.9964	0.9989	(86)
MIT	19.6987	19.8847	20.1642	20.5138	20.7973	20.9513	20.9902	20.9840	20.8776	20.4934	20.0266	19.6687	(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	0.9979	0.9939	0.9815	0.9373	0.8185	0.6072	0.4112	0.4654	0.7606	0.9624	0.9949	0.9985	(89)
MIT 2	18.7563	18.9436	19.2223	19.5703	19.8259	19.9490	19.9684	19.9683	19.9005	19.5584	19.0952	18.7342	(90)
Living area fraction									fLA = Living area / (4) =			0.1967	(91)
MIT	18.9416	19.1287	19.4075	19.7558	20.0170	20.1461	20.1694	20.1681	20.0927	19.7423	19.2784	18.9180	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9416	19.1287	19.4075	19.7558	20.0170	20.1461	20.1694	20.1681	20.0927	19.7423	19.2784	18.9180	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9972	0.9923	0.9783	0.9333	0.8215	0.6239	0.4346	0.4893	0.7710	0.9589	0.9935	0.9980	(94)
Ext temp.	541.8182	659.1489	757.7335	819.4933	773.7013	577.1441	384.7487	402.9000	580.8774	617.1983	541.6420	506.0620	(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	1642.3268	1591.7386	1440.1437	1196.2222	914.3092	603.0234	388.0967	408.8585	654.3577	1005.0380	1345.1759	1633.7468	(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	818.7784	626.7003	507.7132	271.2448	104.6123	0.0000	0.0000	0.0000	0.0000	288.5528	578.5444	838.9974	(98)
Space heating												4035.1436	(98)
Space heating per m2										(98) / (4) =		42.1910	(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	1022.0561	804.5973	824.6490	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8901	0.9420	0.9219	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	909.7676	757.9249	760.2240	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1183.8508	1135.0530	1064.5105	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	197.3399	280.5833	226.3891	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												704.3123	(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	49.3350	70.1458	56.5973	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												176.0781 (107)
Space cooling per m2												1.8411 (108)
Energy for space heating												42.1910 (99)
Energy for space cooling												1.8411 (108)
Total												44.0320 (109)
Target Fabric Energy Efficiency (TFEE)												50.6 (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					4.8200
Infiltration rate					0.4086 (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) =	0.3780 (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	0.4630	0.4347	0.4252	0.3969	0.3969	0.3874	0.3874	0.3780	0.3780	0.4063	0.4063	0.4158 (22b)
Effective ac	0.6072	0.5945	0.5904	0.5788	0.5788	0.5751	0.5751	0.5714	0.5714	0.5826	0.5826	0.5864 (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			47.8200	0.1800	8.6076	75.6000	3615.1920 (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)			194.5370				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	57.1350		(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) = 6114.3592 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							63.9310 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							19.5339 (36)
Total fabric heat loss							(33) + (36) = 76.6689 (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	47.8139	46.8119	46.4920	45.5744	45.5744	45.2826	45.2826	44.9978	44.9978	45.8732	45.8732	46.1791 (38)
Heat transfer coeff	124.4828	123.4808	123.1609	122.2433	122.2433	121.9515	121.9515	121.6667	121.6667	122.5421	122.5421	122.8480 (39)
Average = Sum(39)m / 12 =												122.5650 (39)
HLP	1.3016	1.2911	1.2878	1.2782	1.2782	1.2751	1.2751	1.2721	1.2721	1.2813	1.2813	1.2845 (40)
HLP (average)												1.2815 (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												

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		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
North				5.2480	13.4684		0.7300	0.7200	0.7700		25.7454 (74)	
South				7.1650	56.5862		0.7300	0.7200	0.7700		147.6779 (78)	
West				7.2210	25.1733		0.7300	0.7200	0.7700		66.2103 (80)	

Solar gains	239.6335	357.6741	523.7136	694.7113	766.3049	854.9330	790.7020	729.5921	612.2653	439.5635	288.3381	200.1317 (83)
Total gains	849.6413	963.0503	1105.4196	1239.5232	1273.1301	1327.7822	1243.7031	1191.3593	1095.2631	959.6798	849.7651	793.0166 (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	13.6439	13.7546	13.7904	13.8939	13.8939	13.9271	13.9271	13.9597	13.9597	13.8600	13.8600	13.8255
alpha	1.9096	1.9170	1.9194	1.9263	1.9263	1.9285	1.9285	1.9306	1.9306	1.9240	1.9240	1.9217
util living area	0.8689	0.8377	0.7761	0.6818	0.5646	0.4037	0.2978	0.3004	0.4908	0.6920	0.8199	0.8791 (86)
MIT	18.4016	18.6875	19.2513	19.9028	20.4441	20.8063	20.9277	20.9290	20.7029	20.0962	19.2054	18.3732 (87)
Th 2	19.8396	19.8478	19.8504	19.8580	19.8580	19.8604	19.8604	19.8627	19.8627	19.8555	19.8555	19.8530 (88)
util rest of house	0.8537	0.8195	0.7511	0.6456	0.5109	0.3290	0.2034	0.2023	0.4146	0.6461	0.7959	0.8648 (89)
MIT 2	16.5182	16.9171	17.6974	18.5830	19.2877	19.7105	19.8262	19.8305	19.6128	18.8642	17.6558	16.4848 (90)
Living area fraction									fLA = Living area / (4) =			0.1967 (91)
MIT	16.8887	17.2653	18.0031	18.8425	19.5151	19.9260	20.0428	20.0466	19.8272	19.1065	17.9606	16.8562 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.7387	17.1153	17.8531	18.6925	19.3651	19.7760	19.8928	19.8966	19.6772	18.9565	17.8106	16.7062 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.7976	0.7627	0.6971	0.6026	0.4852	0.3231	0.2062	0.2054	0.4009	0.6034	0.7398	0.8100 (94)
Useful gains	677.7007	734.5175	770.6162	746.9681	617.7491	429.0278	256.4613	244.7411	439.0785	579.0863	628.6678	642.3254 (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	1374.1232	1360.1744	1250.4592	1050.3809	765.8703	472.6854	267.4154	255.0807	508.2236	815.6969	1104.1786	1339.8036 (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	518.1383	420.4414	357.0032	218.4572	110.2022	0.0000	0.0000	0.0000	0.0000	176.0383	342.3678	518.9238 (98)
Space heating												2661.5721 (98)
RHI space heating demand												2662 (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					4.8200
Infiltration rate					0.4086 (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) =	0.3780 (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	0.4819	0.4725	0.4630	0.4158	0.4063	0.3591	0.3591	0.3496	0.3780	0.4063	0.4252	0.4441 (22b)
Effective ac	0.6161	0.6116	0.6072	0.5864	0.5826	0.5645	0.5645	0.5611	0.5714	0.5826	0.5904	0.5986 (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			47.8200	0.1800	8.6076	75.6000	3615.1920 (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)			194.5370				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	57.1350		(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) = 6114.3592 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 63.9310 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 19.5339 (36)
Total fabric heat loss (33) + (36) = 76.6689 (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	48.5170	48.1619	47.8139	46.1791	45.8732	44.4493	44.4493	44.1856	44.9978	45.8732	46.4920	47.1389 (38)
Heat transfer coeff	125.1860	124.8309	124.4828	122.8480	122.5421	121.1183	121.1183	120.8546	121.6667	122.5421	123.1609	123.8078 (39)
Average = Sum(39)m / 12 =												122.8465 (39)
HLP	1.3089	1.3052	1.3016	1.2845	1.2813	1.2664	1.2664	1.2636	1.2721	1.2813	1.2878	1.2945 (40)
HLP (average)												1.2845 (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)

[illegible]

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8282	0.7866	0.7310	0.6504	0.5482	0.4228	0.3063	0.3366	0.5028	0.6783	0.7888	0.8402 (94)
Useful gains	665.8673	743.4324	781.1829	768.2328	683.5664	515.3192	357.6069	369.5628	513.8061	611.6990	627.5279	636.6280 (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	1482.1538	1465.9787	1356.0629	1155.1457	902.4508	605.6832	390.0395	409.9046	646.8060	959.8321	1236.8418	1466.6177 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.6000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	607.3172	485.5511	427.7107	278.5773	162.8500	0.0000	0.0000	0.0000	0.0000	259.0110	438.7060	617.5123 (98)
Space heating												3277.2357 (98)
Space heating per m2												34.2664 (99)
										(98) / (4) =		

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													3633.2990 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	607.3172	485.5511	427.7107	278.5773	162.8500	0.0000	0.0000	0.0000	0.0000	259.0110	438.7060	617.5123	(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)	673.3006	538.3050	474.1804	308.8440	180.5432	0.0000	0.0000	0.0000	0.0000	287.1519	486.3703	684.6035	(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	87.8047	87.6274	87.2668	86.4650	84.9304	76.4000	76.4000	76.4000	76.4000	86.1074	87.3123	87.8978	(216)
Fuel for water heating, kWh/month	123.0428	107.5391	112.0565	101.2686	100.3262	98.0186	93.9736	105.7659	106.3635	107.4136	112.6231	119.1483	(219)
Water heating fuel used												1287.5397	(219)
Annual totals kWh/year													
Space heating fuel - main system												3633.2990	(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												5388.9270	(238)

10a. Fuel costs - using Table 12 prices

	Fuel	Fuel price	Fuel cost
	kWh/year	p/kWh	£/year
Space heating - main system 1	3633.2990	3.4800	126.4388 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1287.5397	3.4800	44.8064 (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			352.9860 (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] = 1.0541 (257)
SAP value	85.2948
SAP rating (Section 12)	85 (258)
SAP band	B

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

	Energy	Emission factor	Emissions
	kWh/year	kg CO2/kWh	kg CO2/year
Space heating - main system 1	3633.2990	0.2160	784.7926 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1287.5397	0.2160	278.1086 (264)
Space and water heating			1062.9011 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	393.0884	0.5190	204.0129 (268)
Total kg/year			1305.8390 (272)
CO2 emissions per m2			13.6500 (273)
EI value			87.5581
EI rating			88 (274)
EI band			B

Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9020 = 3.858$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9020 = 0.2395$, stars = 4
Water heating energy efficiency	$3.48 / 0.8342 = 4.172$, stars = 5
Water heating environmental impact	$0.216 / 0.8342 = 0.2589$, 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	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					4.8200
Infiltration rate					0.4086 (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) =				0.3780 (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	0.4630	0.4347	0.4252	0.3969	0.3969	0.3874	0.3874	0.3780	0.3780	0.4063	0.4063	0.4158 (22b)
	0.6072	0.5945	0.5904	0.5788	0.5788	0.5751	0.5751	0.5714	0.5714	0.5826	0.5826	0.5864 (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			47.8200	0.1800	8.6076	75.6000	3615.1920 (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)			194.5370				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	57.1350		(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) =		6114.3592 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							63.9310 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							19.5339 (36)
Total fabric heat loss					(33) + (36) =		76.6689 (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	47.8139	46.8119	46.4920	45.5744	45.5744	45.2826	45.2826	44.9978	44.9978	45.8732	45.8732	46.1791 (38)
Heat transfer coeff	124.4828	123.4808	123.1609	122.2433	122.2433	121.9515	121.9515	121.6667	121.6667	122.5421	122.5421	122.8480 (39)
Average = Sum(39)m / 12 =												122.5650 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3016	1.2911	1.2878	1.2782	1.2782	1.2751	1.2751	1.2721	1.2721	1.2813	1.2813	1.2845 (40)
HLP (average)												1.2815 (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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.7976	0.7627	0.6971	0.6026	0.4852	0.3231	0.2062	0.2054	0.4009	0.6034	0.7398	0.8100 (94)
Useful gains	677.7007	734.5175	770.6162	746.9681	617.7491	429.0278	256.4613	244.7411	439.0785	579.0863	628.6678	642.3254 (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	1374.1232	1360.1744	1250.4592	1050.3809	765.8703	472.6854	267.4154	255.0807	508.2236	815.6969	1104.1786	1339.8036 (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	518.1383	420.4414	357.0032	218.4572	110.2022	0.0000	0.0000	0.0000	0.0000	176.0383	342.3678	518.9238 (98)
Space heating												2661.5721 (98)
Space heating per m2												27.8291 (99)
										(98) / (4) =		

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													2950.7452 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	518.1383	420.4414	357.0032	218.4572	110.2022	0.0000	0.0000	0.0000	0.0000	176.0383	342.3678	518.9238	(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)	574.4327	466.1213	395.7907	242.1920	122.1754	0.0000	0.0000	0.0000	0.0000	195.1644	379.5652	575.3035	(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	87.4739	87.3124	86.8278	85.7672	83.6144	76.4000	76.4000	76.4000	76.4000	84.9169	86.7055	87.5446	(216)
Fuel for water heating, kWh/month	123.5082	107.9271	112.6230	102.0924	101.9053	98.0186	93.9736	105.7659	106.3635	108.9195	113.4112	119.6290	(219)
Water heating fuel used												1294.1373	(219)
Annual totals kWh/year													
Space heating fuel - main system													2950.7452 (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													4712.9708 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2950.7452	7.6100	224.5517 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1294.1373	7.6100	98.4839 (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			573.5174 (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	2950.7452	0.2160	637.3610 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1294.1373	0.2160	279.5337 (264)
Space and water heating			916.8946 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	393.0884	0.5190	204.0129 (268)
Total kg/year			1159.8325 (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	2950.7452	1.2200	3599.9091 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1294.1373	1.2200	1578.8475 (264)
Space and water heating			5178.7566 (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			6615.7879 (272)
Primary energy kWh/m2/year			69.1739 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:
Current environmental impact rating:

B 85
B 88

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

(For testing purposes):

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

Recommended measures:	SAP change	Cost change	CO2 change
U Solar photovoltaic panels	+ 9.5	-£ 605	-1010 kg (87.1%)
Measures omitted - SAP change or cost saving too small:			
N Solar water heating	+ 0.9	-£ 46	-148 kg (12.8%)

Recommended measures	Typical annual savings		Energy efficiency	Environmental impact
Solar photovoltaic panels	£605	10.56 kg/m ²	A 95	A 96
Total Savings	£605	10.56 kg/m ²		
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	£428	£428	£0
Space heating	£353	£353	£0
Water heating	£98	£98	£0
Lighting	£122	£122	£0
Generated (PV)	-£0	-£605	£605
Total cost of fuels	£573	-£32	£605
Total cost of uses	£573	-£32	£605
Delivered energy	49 kWh/m ²	29 kWh/m ²	20 kWh/m ²
Carbon dioxide emissions	1.2 tonnes	0.1 tonnes	1.0 tonnes
CO2 emissions per m ²	12 kg/m ²	2 kg/m ²	11 kg/m ²
Primary energy	69 kWh/m ²	7 kWh/m ²	62 kWh/m ²

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	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					4.8200
Infiltration rate					0.4086 (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) =	0.3780 (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	0.4819	0.4725	0.4630	0.4158	0.4063	0.3591	0.3591	0.3496	0.3780	0.4063	0.4252	0.4441 (22b)
Effective ac	0.6161	0.6116	0.6072	0.5864	0.5826	0.5645	0.5645	0.5611	0.5714	0.5826	0.5904	0.5986 (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			47.8200	0.1800	8.6076	75.6000	3615.1920 (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)			194.5370				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	57.1350		(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) = 6114.3592 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							63.9310 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							19.5339 (36)
Total fabric heat loss							(33) + (36) = 76.6689 (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	48.5170	48.1619	47.8139	46.1791	45.8732	44.4493	44.4493	44.1856	44.9978	45.8732	46.4920	47.1389 (38)
Heat transfer coeff	125.1860	124.8309	124.4828	122.8480	122.5421	121.1183	121.1183	120.8546	121.6667	122.5421	123.1609	123.8078 (39)
Average = Sum(39)m / 12 =												122.8465 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3089	1.3052	1.3016	1.2845	1.2813	1.2664	1.2664	1.2636	1.2721	1.2813	1.2878	1.2945 (40)
HLP (average)												1.2845 (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 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	5.2480	10.6334	0.7300	0.7200	0.7700	20.3261 (74)
South	7.1650	46.7521	0.7300	0.7200	0.7700	122.0129 (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 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													3633.2990 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	607.3172	485.5511	427.7107	278.5773	162.8500	0.0000	0.0000	0.0000	0.0000	259.0110	438.7060	617.5123	(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)	673.3006	538.3050	474.1804	308.8440	180.5432	0.0000	0.0000	0.0000	0.0000	287.1519	486.3703	684.6035	(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	87.8047	87.6274	87.2668	86.4650	84.9304	76.4000	76.4000	76.4000	76.4000	86.1074	87.3123	87.8978	(216)
Fuel for water heating, kWh/month	123.0428	107.5391	112.0565	101.2686	100.3262	98.0186	93.9736	105.7659	106.3635	107.4136	112.6231	119.1483	(219)
Water heating fuel used												1287.5397	(219)
Annual totals kWh/year													
Space heating fuel - main system												3633.2990	(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												3661.6876	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3633.2990	3.4800	126.4388 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1287.5397	3.4800	44.8064 (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			125.1632 (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] =	0.3738 (257)
SAP value		94.7858
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	3633.2990	0.2160	784.7926 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1287.5397	0.2160	278.1086 (264)
Space and water heating			1062.9011 (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			409.4018 (272)
CO2 emissions per m2			4.2800 (273)
EI value			96.0993
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	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					4.8200
Infiltration rate					0.4086 (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) =				0.3780 (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	0.4630	0.4347	0.4252	0.3969	0.3969	0.3874	0.3874	0.3780	0.3780	0.4063	0.4063	0.4158 (22b)
Effective ac	0.6072	0.5945	0.5904	0.5788	0.5788	0.5751	0.5751	0.5714	0.5714	0.5826	0.5826	0.5864 (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			47.8200	0.1800	8.6076	75.6000	3615.1920 (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)			194.5370				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	57.1350		(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) = 6114.3592 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							63.9310 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							19.5339 (36)
Total fabric heat loss							(33) + (36) = 76.6689 (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	47.8139	46.8119	46.4920	45.5744	45.5744	45.2826	45.2826	44.9978	44.9978	45.8732	45.8732	46.1791 (38)
Heat transfer coeff	124.4828	123.4808	123.1609	122.2433	122.2433	121.9515	121.9515	121.6667	121.6667	122.5421	122.5421	122.8480 (39)
Average = Sum(39)m / 12 =												122.5650 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3016	1.2911	1.2878	1.2782	1.2782	1.2751	1.2751	1.2721	1.2721	1.2813	1.2813	1.2845 (40)
HLP (average)												1.2815 (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												

[illegible]

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	5.2480	13.4684	0.7300	0.7200	0.7700	25.7454 (74)
South	7.1650	56.5862	0.7300	0.7200	0.7700	147.6779 (78)
West	7.2210	25.1733	0.7300	0.7200	0.7700	66.2103 (80)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, n _{l,m} (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	13.6439	13.7546	13.7904	13.8939	13.8939	13.9271	13.9271	13.9597	13.9597	13.8600	13.8600	13.8255
alpha	1.9096	1.9170	1.9194	1.9263	1.9263	1.9285	1.9285	1.9306	1.9306	1.9240	1.9240	1.9217
util living area	0.8689	0.8377	0.7761	0.6818	0.5646	0.4037	0.2978	0.3004	0.4908	0.6920	0.8199	0.8791 (86)
MIT	18.4016	18.6875	19.2513	19.9028	20.4441	20.8063	20.9277	20.9290	20.7029	20.0962	19.2054	18.3732 (87)
Th 2	19.8396	19.8478	19.8504	19.8580	19.8580	19.8604	19.8604	19.8627	19.8627	19.8555	19.8555	19.8530 (88)
util rest of house	0.8537	0.8195	0.7511	0.6456	0.5109	0.3290	0.2034	0.2023	0.4146	0.6461	0.7959	0.8648 (89)
MIT 2	16.5182	16.9171	17.6974	18.5830	19.2877	19.7105	19.8262	19.8305	19.6128	18.8642	17.6558	16.4848 (90)
Living area fraction												
MIT	16.8887	17.2653	18.0031	18.8425	19.5151	19.9260	20.0428	20.0466	19.8272	19.1065	17.9606	16.8562 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.7387	17.1153	17.8531	18.6925	19.3651	19.7760	19.8928	19.8966	19.6772	18.9565	17.8106	16.7062 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.7976	0.7627	0.6971	0.6026	0.4852	0.3231	0.2062	0.2054	0.4009	0.6034	0.7398	0.8100 (94)
Useful gains	677.7007	734.5175	770.6162	746.9681	617.7491	429.0278	256.4613	244.7411	439.0785	579.0863	628.6678	642.3254 (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	1374.1232	1360.1744	1250.4592	1050.3809	765.8703	472.6854	267.4154	255.0807	508.2236	815.6969	1104.1786	1339.8036 (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	518.1383	420.4414	357.0032	218.4572	110.2022	0.0000	0.0000	0.0000	0.0000	176.0383	342.3678	518.9238 (98)
Space heating												2661.5721 (98)
Space heating per m2												27.8291 (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													2950.7452 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	518.1383	420.4414	357.0032	218.4572	110.2022	0.0000	0.0000	0.0000	0.0000	176.0383	342.3678	518.9238	(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)	574.4327	466.1213	395.7907	242.1920	122.1754	0.0000	0.0000	0.0000	0.0000	195.1644	379.5652	575.3035	(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	87.4739	87.3124	86.8278	85.7672	83.6144	76.4000	76.4000	76.4000	76.4000	84.9169	86.7055	87.5446	(216)
Fuel for water heating, kWh/month	123.5082	107.9271	112.6230	102.0924	101.9053	98.0186	93.9736	105.7659	106.3635	108.9195	113.4112	119.6290	(219)
Water heating fuel used												1294.1373	(219)
Annual totals kWh/year													
Space heating fuel - main system												2950.7452	(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												2766.5249	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2950.7452	7.6100	224.5517 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1294.1373	7.6100	98.4839 (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			-31.4380 (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	2950.7452	0.2160	637.3610 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1294.1373	0.2160	279.5337 (264)
Space and water heating			916.8946 (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			149.6270 (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	2950.7452	1.2200	3599.9091 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1294.1373	1.2200	1578.8475 (264)
Space and water heating			5178.7566 (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			640.1989 (272)
Primary energy kWh/m2/year			6.6938 (273)

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Built)

Property Reference	011 - PRJ013014	Issued on Date	11/01/2024
Assessment Reference	011	Prop Type Ref	D
Property	21 Deeble Way, Netley Abbey, Southampton, SO31 5JP		
SAP Rating	85 B	DER	14.50
Environmental	88 B	TER	17.11
CO ₂ Emissions (t/year)	1.16	% DER<TER	15.24
General Requirements Compliance	Pass	DFEE	46.65
		TFEE	50.64
		% DFEE<TFEE	7.87
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)	17.11	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.50	kgCO ₂ /m ²	Pass
	-2.61 (-15.3%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	50.64	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	46.65	kWh/m ² /yr	
	-4.0 (-7.9%)	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	4.82 (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

5.25 m², No overhang

Windows facing South

7.17 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

4.82 (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