

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



Property Reference	4907-T511-3796-238			Issued on Date	01/12/2023
Assessment Reference	As Built	Prop Type Ref	RPv3 Det Op		
Property	67, Pembers Farm Avenue, Fair Oak, EASTLEIGH, SO50 7QL				
SAP Rating	88 B	DER	12.65	TER	16.79
Environmental	88 B	% DER<TER	24.65		
CO ₂ Emissions (t/year)	1.37	DFEE	50.65	TFEE	59.33
General Requirements Compliance	Pass	% DFEE<TFEE	14.63		
Assessor Details	Miss Lindsey Dean, Lindsey Dean, Tel: 01884 242050, Lindsey.dean@aessc.co.uk			Assessor ID	T510-0001
Client	Drew Smith				

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

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DWELLING AS BUILT

Detached House, total floor area 137 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) 16.79 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 12.65 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)59.3 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)50.6 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.32 (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	0.17 (max. 0.20)	0.28 (max. 0.35)	OK
Openings	1.41 (max. 2.00)	1.80 (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:	4.36 (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

Ideal LOGIC SYSTEM s18

Efficiency: 89.6% SEDBUK2009

Minimum: 88.0% OK

Secondary heating system: None

5 Cylinder insulation

Hot water storage	Measured cylinder loss: 1.42 kWh/day	
Permitted by DBSCG 2.30	OK	
Primary pipework insulated:	Yes	OK

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls: Cylinderstat OK
Independent timer for DHW OK

Boiler interlock Yes OK

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system (decentralised)

Specific fan power: 0.1700 0.1800
Maximum 0.7 OK

9 Summertime temperature

Overheating risk (Southern England): Slight OK

Based on:

Overshading:	Average
Windows facing North:	8.24 m ² , No overhang
Windows facing East:	4.25 m ² , No overhang
Windows facing South:	8.65 m ² , No overhang
Windows facing West:	0.60 m ² , No overhang
Air change rate:	4.00 ach
Blinds/curtains:	None

10 Key features

External wall U-value	0.14 W/m ² K
Party wall U-value	0.00 W/m ² K
Roof U-value	0.11 W/m ² K
Photovoltaic array	0.99 kW

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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	53.1200 (1b)	x 2.4000 (2b)	= 127.4880 (1b) - (3b)
First floor	53.1200 (1c)	x 2.6900 (2c)	= 142.8928 (1c) - (3c)
Second floor	30.8200 (1d)	x 2.5000 (2d)	= 77.0500 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	137.0600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 347.4308 (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							0 * 10 =	0.0000 (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) =						0.0000 / (5) =	0.0000 (8)				
Pressure test							Yes					
Measured/design AP50							4.3600					
Infiltration rate							0.2180	(18)				
Number of sides sheltered							0	(19)				
Shelter factor							(20) = 1 - [0.075 x (19)] =	1.0000 (20)				
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.2180 (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)
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												
	0.2780	0.2725	0.2671	0.2398	0.2344	0.2071	0.2071	0.2017	0.2180	0.2344	0.2453	0.2562 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5280	0.5225	0.5171	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5062 (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			2.1200	1.3000	2.7560		(26)					
Window (Uw = 1.40)			17.2200	1.3258	22.8295		(27)					
French Door (Uw = 1.40)			4.5200	1.3258	5.9924		(27)					
Roof Window (Uw = 1.80)			1.4600	1.6791	2.4515		(27a)					
150mm EPS B&B			53.1200	0.1800	9.5616	75.0000	3984.0000 (28a)					
140mm Timber Frame	172.8600	21.4100	151.4500	0.1900	28.7755	9.0000	1363.0500 (29a)					
W2V	30.7800		30.7800	0.1400	4.3092	18.0000	554.0400 (29a)					
Dormer Cheek	10.5100	2.4500	8.0600	0.3200	2.5792	18.0000	145.0800 (29a)					
400mm Mineral Wool	14.3700		14.3700	0.1100	1.5807	9.0000	129.3300 (30)					
Sloping	43.0100	1.4600	41.5500	0.2000	8.3100	9.0000	373.9500 (30)					
Dormer Roof	4.3500		4.3500	0.2800	1.2180	9.0000	39.1500 (30)					
C2V	22.3000		22.3000	0.1400	3.1220	9.0000	200.7000 (30)					
Total net area of external elements Aum(A, m2)			351.3000				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		93.4857		(33)					
Timber GF			74.7800			9.0000	673.0200 (32c)					
Timber FF			135.1700			9.0000	1216.5300 (32c)					
Timber 2F			38.0200			9.0000	342.1800 (32c)					
Internal Floor			53.1200			18.0000	956.1600 (32d)					
Internal Floor 2			30.8200			18.0000	554.7600 (32d)					
Internal Ceiling			53.1200			18.0000	956.1600 (32e)					
Internal Ceiling 2			30.8200			18.0000	554.7600 (32e)					
Heat capacity Cm = Sum(A x k)					(28) ... (30) + (32) + (32a) ... (32e) =		12042.8700 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							87.8657 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							18.5664 (36)					
Total fabric heat loss						(33) + (36) =	112.0520 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 60.5306	Feb 59.9058	Mar 59.2809	Apr 57.3261	May 57.3261	Jun 57.3261	Jul 57.3261	Aug 57.3261	Sep 57.3261	Oct 57.3261	Nov 57.3261	Dec 58.0312 (38)
Heat transfer coeff	172.5826	171.9578	171.3329	169.3781	169.3781	169.3781	169.3781	169.3781	169.3781	169.3781	169.3781	170.0832 (39)
Average = Sum(39)m / 12 =												170.0818 (39)
HLP	Jan 1.2592	Feb 1.2546	Mar 1.2501	Apr 1.2358	May 1.2358	Jun 1.2358	Jul 1.2358	Aug 1.2358	Sep 1.2358	Oct 1.2358	Nov 1.2358	Dec 1.2409 (40)
HLP (average)												1.2409 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9113 (42)
Average daily hot water use (litres/day)												103.3426 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	113.6769	109.5432	105.4095	101.2758	97.1421	93.0084	93.0084	97.1421	101.2758	105.4095	109.5432	113.6769 (44)
Energy content	168.5795	147.4407	152.1456	132.6442	127.2753	109.8289	101.7726	116.7856	118.1804	137.7278	150.3407	163.2603 (45)
Energy content (annual)												Total = Sum(45)m = 1625.9817 (45)
Distribution loss (46)m = 0.15 x (45)m	25.2869	22.1161	22.8218	19.8966	19.0913	16.4743	15.2659	17.5178	17.7271	20.6592	22.5511	24.4890 (46)
Water storage loss:												210.0000 (47)
Store volume												1.4200 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.7668 (55)
Enter (49) or (54) in (55)												
Total storage loss	23.7708	21.4704	23.7708	23.0040	23.7708	23.0040	23.7708	23.7708	23.0040	23.7708	23.0040	23.7708 (56)
If cylinder contains dedicated solar storage	23.7708	21.4704	23.7708	23.0040	23.7708	23.0040	23.7708	23.7708	23.0040	23.7708	23.0040	23.7708 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	215.6127	189.9223	199.1788	178.1602	174.3085	155.3449	148.8058	163.8188	163.6964	184.7610	195.8567	210.2935 (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)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h	215.6127	189.9223	199.1788	178.1602	174.3085	155.3449	148.8058	163.8188	163.6964	184.7610	195.8567	210.2935 (64)
Total per year (kWh/year) = Sum(64)m =												2179.7597 (64)
Heat gains from water heating, kWh/month	93.6792	83.0093	88.2150	80.5170	79.9456	72.9309	71.4660	76.4578	75.7078	83.4211	86.4011	91.9106 (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	145.5634	145.5634	145.5634	145.5634	145.5634	145.5634	145.5634	145.5634	145.5634	145.5634	145.5634	145.5634 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.0970	24.9555	20.2952	15.3647	11.4853	9.6964	10.4773	13.6188	18.2791	23.2095	27.0890	28.8779 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	306.0438	309.2195	301.2167	284.1795	262.6732	242.4603	228.9569	225.7811	233.7839	250.8211	272.3274	292.5403 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.5563	37.5563	37.5563	37.5563	37.5563	37.5563	37.5563	37.5563	37.5563	37.5563	37.5563	37.5563 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507 (71)
Water heating gains (Table 5)	125.9130	123.5258	118.5685	111.8292	107.4538	101.2929	96.0564	102.7658	105.1497	112.1251	120.0015	123.5357 (72)
Total internal gains	529.7227	527.3698	509.7494	481.0425	451.2813	423.1187	405.1596	411.8347	426.8818	455.8247	489.0869	514.6229 (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				8.2400	10.6334		0.7200		0.7000		0.7700		30.6029 (74)
East				4.2500	19.6403		0.7200		0.7000		0.7700		29.1541 (76)
South				4.1300	46.7521		0.7200		0.7000		0.7700		67.4395 (78)
West				0.6000	19.6403		0.7200		0.7000		0.7700		4.1159 (80)
South				4.5200	46.7521		0.7200		0.7000		0.7700		73.8079 (78)
West				1.4600	26.0000		0.6300		0.7000		1.0000		15.0663 (82)
Solar gains	220.1867	386.1855	556.8599	735.9081	864.9153	876.1918	837.4721	738.7741	618.5993	434.5970	265.7855		187.0915 (83)
Total gains	749.9094	913.5553	1066.6093	1216.9505	1316.1967	1299.3105	1242.6317	1150.6088	1045.4811	890.4218	754.8723		701.7144 (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	19.3834	19.4539	19.5248	19.7501	19.7501	19.7501	19.7501	19.7501	19.7501	19.7501	19.7501	19.6683
alpha	2.2922	2.2969	2.3017	2.3167	2.3167	2.3167	2.3167	2.3167	2.3167	2.3167	2.3167	2.3112
util living area	0.9658	0.9461	0.9132	0.8524	0.7584	0.6331	0.5098	0.5550	0.7364	0.8864	0.9501	0.9703 (86)
MIT	18.0847	18.4232	18.9528	19.6209	20.2138	20.6439	20.8477	20.8086	20.4566	19.6753	18.7695	18.0401 (87)
Th 2	19.8730	19.8766	19.8802	19.8915	19.8915	19.8915	19.8915	19.8915	19.8915	19.8915	19.8915	19.8874 (88)
util rest of house	0.9608	0.9383	0.9001	0.8289	0.7167	0.5620	0.4071	0.4539	0.6759	0.8633	0.9416	0.9660 (89)
MIT 2	15.9811	16.4716	17.2353	18.1894	19.0052	19.5601	19.7885	19.7536	19.3442	18.2849	16.9865	15.9232 (90)
Living area fraction	16.2362	16.7083	17.4436	18.3629	19.1517	19.6915	19.9169	19.8815	19.4791	18.4535	17.2027	16.1799 (92)
Temperature adjustment	16.0862	16.5583	17.2936	18.2129	19.0017	19.5415	19.7669	19.7315	19.3291	18.3035	17.0527	-0.1500
adjusted MIT	16.0862	16.5583	17.2936	18.2129	19.0017	19.5415	19.7669	19.7315	19.3291	18.3035	17.0527	16.0299 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9334	0.9032	0.8576	0.7829	0.6765	0.5364	0.3943	0.4375	0.6388	0.8176	0.9077	0.9411	(94)
Useful gains	699.9670	825.1633	914.7243	952.7345	890.3682	696.8855	490.0090	503.3610	667.8337	728.0096	685.2141	660.4056	(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	2034.0941	2004.7300	1849.2932	1577.4096	1236.7551	836.9828	536.4063	564.2862	885.6940	1304.8087	1685.7658	2012.0739	(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	992.5906	792.6689	695.3192	449.7660	257.7119	0.0000	0.0000	0.0000	0.0000	429.1385	720.3972	1005.6412	(98)
Space heating													
Space heating per m2													(98) / (4) = 38.9846 (99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.6000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													5897.6087 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	992.5906	792.6689	695.3192	449.7660	257.7119	0.0000	0.0000	0.0000	0.0000	429.1385	720.3972	1005.6412	(98)
Space heating efficiency (main heating system 1)	90.6000	90.6000	90.6000	90.6000	90.6000	0.0000	0.0000	0.0000	0.0000	90.6000	90.6000	90.6000	(210)
Space heating fuel (main heating system)	1095.5746	874.9104	767.4605	496.4305	284.4502	0.0000	0.0000	0.0000	0.0000	473.6628	795.1404	1109.9792	(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	215.6127	189.9223	199.1788	178.1602	174.3085	155.3449	148.8058	163.8188	163.6964	184.7610	195.8567	210.2935	(64)
Efficiency of water heater	88.4853	88.3140	87.9766	87.2836	85.9556	79.9000	79.9000	79.9000	79.9000	87.0899	88.0787	88.5491	(217)
Fuel for water heating, kWh/month	243.6706	215.0534	226.3998	204.1166	202.7889	194.4242	186.2401	205.0298	204.8766	212.1497	222.3656	237.4879	(219)
Water heating fuel used												2554.6031	(219)
Annual totals kWh/year													
Space heating fuel - main system													5897.6087 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 12.2330, total flow = 53.0000, SFP = 0.2308)													
mechanical ventilation fans (SFP = 0.2308)													97.8330 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													172.8330 (231)
Electricity for lighting (calculated in Appendix L)													496.2015 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.99 * 1068 * 1.00) =										-845.9118			-845.9118 (233)
Total delivered energy for all uses													8275.3344 (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	5897.6087	0.2160	1273.8835	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2554.6031	0.2160	551.7943	(264)
Space and water heating			1825.6778	(265)
Pumps and fans	172.8330	0.5190	89.7003	(267)
Energy for lighting	496.2015	0.5190	257.5286	(268)
Energy saving/generation technologies				
PV Unit	-845.9118	0.5190	-439.0282	(269)
Total CO2, kg/year			1733.8784	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			12.6500	(273)

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

DER			12.6500	ZC1
Total Floor Area		TFA	137.0600	
Assumed number of occupants		N	2.9113	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			13.2318	ZC2
CO2 emissions from cooking, equation (L16)			1.3780	ZC3
Total CO2 emissions			27.2598	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			27.2598	ZC8

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Calculation Type: New Build (As Built)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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	53.1200 (1b)	x 2.4000 (2b)	= 127.4880 (1b) - (3b)
First floor	53.1200 (1c)	x 2.6900 (2c)	= 142.8928 (1c) - (3c)
Second floor	30.8200 (1d)	x 2.5000 (2d)	= 77.0500 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	137.0600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 347.4308 (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) =	0.1151 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3651 (18)
Number of sides sheltered					0 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		1.0000 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3651 (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	0.4655	0.4564	0.4473	0.4016	0.3925	0.3469	0.3469	0.3377	0.3651	0.3925	0.4108	0.4290 (22b)
Effective ac	0.6084	0.6042	0.6000	0.5807	0.5770	0.5602	0.5602	0.5570	0.5667	0.5770	0.5844	0.5920 (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			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.40)			21.7400	1.3258	28.8220		(27)
TER Room Window (Uw = 1.70)			1.4600	1.5918	2.3240		(27a)
150mm EPS B&B			53.1200	0.1300	6.9056		(28a)
140mm Timber Frame	172.8600	21.4100	151.4500	0.1800	27.2610		(29a)
W2V	30.7800		30.7800	0.1800	5.5404		(29a)
Dormer Cheek	10.5100	2.4500	8.0600	0.1800	1.4508		(29a)
400mm Mineral Wool	14.3700		14.3700	0.1300	1.8681		(30)
Sloping	43.0100	1.4600	41.5500	0.1300	5.4015		(30)
Dormer Roof	4.3500		4.3500	0.1300	0.5655		(30)
C2V	22.3000		22.3000	0.1300	2.8990		(30)
Total net area of external elements Aum(A, m ²)			351.3000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	85.1578		(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)							14.8024 (36)
Total fabric heat loss						(33) + (36) =	99.9602 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	69.7503	69.2679	68.7950	66.5738	66.1582	64.2237	64.2237	63.8654	64.9688	66.1582	66.9989	67.8778 (38)
Average = Sum(39)m / 12 =	169.7106	169.2281	168.7552	166.5340	166.1185	164.1839	164.1839	163.8256	164.9291	166.1185	166.9592	167.8381 (39)
	166.5321 (39)											
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2382	1.2347	1.2313	1.2150	1.2120	1.1979	1.1979	1.1953	1.2033	1.2120	1.2181	1.2246 (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												2.9113 (42)
Average daily hot water use (litres/day)												103.3426 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	113.6769	109.5432	105.4095	101.2758	97.1421	93.0084	93.0084	97.1421	101.2758	105.4095	109.5432	113.6769 (44)
	168.5795	147.4407	152.1456	132.6442	127.2753	109.8289	101.7726	116.7856	118.1804	137.7278	150.3407	163.2603 (45)

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Energy content (annual)												Total = Sum(45)m = 1625.9817 (45)
Distribution loss (46)m = 0.15 x (45)m												
	25.2869	22.1161	22.8218	19.8966	19.0913	16.4743	15.2659	17.5178	17.7271	20.6592	22.5511	24.4890 (46)
Water storage loss:												
Store volume												210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7016 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.9188 (55)
Total storage loss												
	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842 (56)
If cylinder contains dedicated solar storage												
	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
	220.3261	194.1796	203.8922	182.7216	179.0219	159.9063	153.5192	168.5322	168.2577	189.4744	200.4180	215.0069 (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)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h												
	220.3261	194.1796	203.8922	182.7216	179.0219	159.9063	153.5192	168.5322	168.2577	189.4744	200.4180	215.0069 (64)
Heat gains from water heating, kWh/month												
	97.4500	86.4151	91.9857	84.1661	83.7163	76.5800	75.2367	80.2285	79.3568	87.1918	90.0502	95.6813 (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	145.5634	145.5634	145.5634	145.5634	145.5634	145.5634	145.5634	145.5634	145.5634	145.5634	145.5634	145.5634 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	28.0970	24.9555	20.2952	15.3647	11.4853	9.6964	10.4773	13.6188	18.2791	23.2095	27.0890	28.8779 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	306.0438	309.2195	301.2167	284.1795	262.6732	242.4603	228.9569	225.7811	233.7839	250.8211	272.3274	292.5403 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	37.5563	37.5563	37.5563	37.5563	37.5563	37.5563	37.5563	37.5563	37.5563	37.5563	37.5563	37.5563 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507 (71)
Water heating gains (Table 5)												
	130.9811	128.5939	123.6367	116.8973	112.5219	106.3611	101.1246	107.8340	110.2178	117.1932	125.0697	128.6039 (72)
Total internal gains	534.7909	532.4380	514.8175	486.1107	456.3495	428.1868	410.2277	416.9029	431.9499	460.8929	494.1550	519.6911 (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				8.2400	10.6334		0.6300		0.7000		0.7700		26.7776 (74)
East				4.2500	19.6403		0.6300		0.7000		0.7700		25.5099 (76)
South				8.6500	46.7521		0.6300		0.7000		0.7700		123.5915 (78)
West				0.6000	19.6403		0.6300		0.7000		0.7700		3.6014 (80)
West				1.4600	26.0000		0.6300		0.7000		1.0000		15.0663 (82)
Solar gains	194.5467	341.8237	494.2061	654.7847	770.7083	781.1547	746.4782	657.7995	549.6043	385.0531	234.9526		165.2262 (83)
Total gains	729.3375	874.2617	1009.0237	1140.8953	1227.0578	1209.3415	1156.7059	1074.7024	981.5543	845.9459	729.1076		684.9173 (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	56.0841	56.2439	56.4015	57.1538	57.2968	57.9719	57.9719	58.0987	57.7100	57.2968	57.0083	56.7097
alpha	4.7389	4.7496	4.7601	4.8103	4.8198	4.8648	4.8648	4.8732	4.8473	4.8198	4.8006	4.7806
util living area	0.9988	0.9969	0.9913	0.9708	0.9082	0.7665	0.5992	0.6588	0.8840	0.9834	0.9974	0.9991 (86)
MIT	19.5800	19.7496	20.0231	20.3855	20.7083	20.9159	20.9801	20.9690	20.8166	20.3931	19.9215	19.5564 (87)
Th 2	19.8895	19.8923	19.8951	19.9080	19.9104	19.9217	19.9217	19.9238	19.9173	19.9104	19.9055	19.9004 (88)
util rest of house	0.9984	0.9958	0.9880	0.9588	0.8688	0.6740	0.4650	0.5248	0.8194	0.9745	0.9962	0.9988 (89)
MIT 2	17.9955	18.2452	18.6454	19.1747	19.6149	19.8634	19.9142	19.9106	19.7631	19.1937	18.5062	17.9686 (90)
Living area fraction	18.1877	18.4277	18.8125	19.3215	19.7475	19.9910	20.0434	20.0389	19.8909	19.3391	18.6778	18.1611 (91)
MIT	18.1877	18.4277	18.8125	19.3215	19.7475	19.9910	20.0434	20.0389	19.8909	19.3391	18.6778	18.1611 (92)
Temperature adjustment												0.0000
adjusted MIT	18.1877	18.4277	18.8125	19.3215	19.7475	19.9910	20.0434	20.0389	19.8909	19.3391	18.6778	18.1611 (93)

8. Space heating requirement

Utilisation	0.9973	0.9936	0.9832	0.9501	0.8616	0.6807	0.4810	0.5403	0.8175	0.9677	0.9942	0.9980 (94)
Useful gains	727.3940	868.6534	992.0897	1083.9564	1057.2636	823.2055	556.3414	580.6367	802.3755	818.6254	724.8819	683.5616 (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	2356.8808	2289.2599	2077.7967	1735.5371	1336.8334	885.1185	565.3582	596.1469	955.0809	1451.7253	1933.0154	2343.2098 (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	1212.3382	954.6476	807.7660	469.1381	207.9999	0.0000	0.0000	0.0000	0.0000	471.0263	869.8561	1234.7782 (98)

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Space heating
Space heating per m2 (98) / (4) = 6227.5504 (98)
45.4367 (99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													6660.4817 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1212.3382	954.6476	807.7660	469.1381	207.9999	0.0000	0.0000	0.0000	0.0000	471.0263	869.8561	1234.7782	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	1296.6184	1021.0135	863.9209	501.7519	222.4598	0.0000	0.0000	0.0000	0.0000	503.7714	930.3274	1320.6184	(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	220.3261	194.1796	203.8922	182.7216	179.0219	159.9063	153.5192	168.5322	168.2577	189.4744	200.4180	215.0069	(64)
Efficiency of water heater (217)m	88.6715	88.4944	88.1187	87.2218	85.2147	79.8000	79.8000	79.8000	79.8000	87.1479	88.2833	88.7355	(216)
Fuel for water heating, kWh/month	248.4744	219.4259	231.3836	209.4908	210.0832	200.3838	192.3800	211.1932	210.8493	217.4170	227.0169	242.3009	(217)
Water heating fuel used												2620.3990	(219)
Annual totals kWh/year													
Space heating fuel - main system												6660.4817	(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)												496.2015	(232)
Total delivered energy for all uses												9852.0822	(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	6660.4817	0.2160	1438.6640 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2620.3990	0.2160	566.0062 (264)
Space and water heating			2004.6702 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	496.2015	0.5190	257.5286 (268)
Total CO2, kg/m2/year			2301.1238 (272)
Emissions per m2 for space and water heating			14.6262 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			1.8789 (272b)
Emissions per m2 for pumps and fans			0.2840 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.6262 * 1.00) + 1.8789 + 0.2840, rounded to 2 d.p.			16.7900 (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	53.1200 (1b)	x 2.4000 (2b)	= 127.4880 (1b) - (3b)
First floor	53.1200 (1c)	x 2.6900 (2c)	= 142.8928 (1c) - (3c)
Second floor	30.8200 (1d)	x 2.5000 (2d)	= 77.0500 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	137.0600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 347.4308 (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) =				Air changes per hour 40.0000 / (5) = 0.1151 (8)
Pressure test					Yes
Measured/design AP50					4.3600
Infiltration rate					0.3331 (18)
Number of sides sheltered					0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3331 (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	0.4247	0.4164	0.4081	0.3664	0.3581	0.3165	0.3165	0.3081	0.3331	0.3581	0.3748	0.3914 (22b)
Effective ac	0.5902	0.5867	0.5833	0.5671	0.5641	0.5501	0.5501	0.5475	0.5555	0.5641	0.5702	0.5766 (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			2.1200	1.3000	2.7560			(26)					
Window (Uw = 1.40)			17.2200	1.3258	22.8295			(27)					
French Door (Uw = 1.40)			4.5200	1.3258	5.9924			(27)					
Roof Window (Uw = 1.80)			1.4600	1.6791	2.4515			(27a)					
150mm EPS B&B			53.1200	0.1800	9.5616	75.0000	3984.0000	(28a)					
140mm Timber Frame	172.8600	21.4100	151.4500	0.1900	28.7755	9.0000	1363.0500	(29a)					
W2V	30.7800		30.7800	0.1400	4.3092	18.0000	554.0400	(29a)					
Dormer Cheek	10.5100	2.4500	8.0600	0.3200	2.5792	18.0000	145.0800	(29a)					
400mm Mineral Wool	14.3700		14.3700	0.1100	1.5807	9.0000	129.3300	(30)					
Sloping	43.0100	1.4600	41.5500	0.2000	8.3100	9.0000	373.9500	(30)					
Dormer Roof	4.3500		4.3500	0.2800	1.2180	9.0000	39.1500	(30)					
C2V	22.3000		22.3000	0.1400	3.1220	9.0000	200.7000	(30)					
Total net area of external elements Aum(A, m2)			351.3000					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	93.4857			(33)					
Timber GF			74.7800			9.0000	673.0200	(32c)					
Timber FF			135.1700			9.0000	1216.5300	(32c)					
Timber 2F			38.0200			9.0000	342.1800	(32c)					
Internal Floor			53.1200			18.0000	956.1600	(32d)					
Internal Floor 2			30.8200			18.0000	554.7600	(32d)					
Internal Ceiling			53.1200			9.0000	478.0800	(32e)					
Internal Ceiling 2			30.8200			9.0000	277.3800	(32e)					
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		11287.4100	(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							82.3538	(35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							18.5664	(36)					
Total fabric heat loss						(33) + (36) =	112.0520	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 67.6680	Feb 67.2664	Mar 66.8728	Apr 65.0239	May 64.6780	Jun 63.0676	Jul 63.0676	Aug 62.7694	Sep 63.6879	Oct 64.6780	Nov 65.3778	Dec 66.1094	(38)
Heat transfer coeff	179.7200	179.3185	178.9248	177.0759	176.7300	175.1196	175.1196	174.8214	175.7399	176.7300	177.4298	178.1614	(39)
Average = Sum(39)m / 12 =												177.0742	(39)
HLP	Jan 1.3113	Feb 1.3083	Mar 1.3054	Apr 1.2920	May 1.2894	Jun 1.2777	Jul 1.2777	Aug 1.2755	Sep 1.2822	Oct 1.2894	Nov 1.2945	Dec 1.2999	(40)
HLP (average)												1.2919	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.9113 (42)											
Average daily hot water use (litres/day)	103.3426 (43)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	113.6769	109.5432	105.4095	101.2758	97.1421	93.0084	93.0084	97.1421	101.2758	105.4095	109.5432	113.6769 (44)
Energy content (annual)	168.5795	147.4407	152.1456	132.6442	127.2753	109.8289	101.7726	116.7856	118.1804	137.7278	150.3407	163.2603 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	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	35.8231	31.3312	32.3309	28.1869	27.0460	23.3386	21.6267	24.8169	25.1133	29.2672	31.9474	34.6928 (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	145.5634	145.5634	145.5634	145.5634	145.5634	145.5634	145.5634	145.5634	145.5634	145.5634	145.5634	145.5634 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.0970	24.9555	20.2952	15.3647	11.4853	9.6964	10.4773	13.6188	18.2791	23.2095	27.0890	28.8779 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	306.0438	309.2195	301.2167	284.1795	262.6732	242.4603	228.9569	225.7811	233.7839	250.8211	272.3274	292.5403 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.5563	37.5563	37.5563	37.5563	37.5563	37.5563	37.5563	37.5563	37.5563	37.5563	37.5563	37.5563 (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)	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507 (71)
Water heating gains (Table 5)	48.1494	46.6237	43.4556	39.1485	36.3522	32.4148	29.0681	33.3561	34.8796	39.3376	44.3714	46.6301 (72)
Total internal gains	448.9591	447.4678	431.6364	405.3618	377.1797	351.2405	335.1713	339.4250	353.6117	380.0372	410.4567	434.7173 (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				8.2400	10.6334	0.7200	0.7000	0.7700	30.6029 (74)			
East				4.2500	19.6403	0.7200	0.7000	0.7700	29.1541 (76)			
South				4.1300	46.7521	0.7200	0.7000	0.7700	67.4395 (78)			
West				0.6000	19.6403	0.7200	0.7000	0.7700	4.1159 (80)			
South				4.5200	46.7521	0.7200	0.7000	0.7700	73.8079 (78)			
West				1.4600	26.0000	0.6300	0.7000	1.0000	15.0663 (82)			
Solar gains	220.1867	386.1855	556.8599	735.9081	864.9153	876.1918	837.4721	738.7741	618.5993	434.5970	265.7855	187.0915 (83)
Total gains	669.1459	833.6533	988.4963	1141.2698	1242.0951	1227.4323	1172.6434	1078.1991	972.2110	814.6343	676.2422	621.8088 (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	17.4460	17.4850	17.5235	17.7065	17.7411	17.9043	17.9043	17.9348	17.8411	17.7411	17.6712	17.5986
alpha	2.1631	2.1657	2.1682	2.1804	2.1827	2.1936	2.1936	2.1957	2.1894	2.1827	2.1781	2.1732
util living area	0.9695	0.9508	0.9198	0.8632	0.7753	0.6551	0.5356	0.5821	0.7584	0.8981	0.9559	0.9738 (86)
MIT	17.7711	18.1223	18.6822	19.4001	20.0584	20.5600	20.8021	20.7545	20.3406	19.4693	18.4870	17.7093 (87)
Th 2	19.8320	19.8343	19.8366	19.8471	19.8491	19.8584	19.8584	19.8601	19.8548	19.8491	19.8451	19.8409 (88)
util rest of house	0.9650	0.9436	0.9077	0.8409	0.7349	0.5841	0.4294	0.4788	0.6999	0.8769	0.9483	0.9699 (89)
MIT 2	16.8871	17.2356	17.7886	18.4943	19.1194	19.5751	19.7652	19.7368	19.3958	18.5759	17.6079	16.8316 (90)
Living area fraction	16.9943	17.3431	17.8969	18.6041	19.2333	19.6945	19.8909	19.8602	19.5103	18.6843	17.7145	0.1213 (91)
MIT	16.9943	17.3431	17.8969	18.6041	19.2333	19.6945	19.8909	19.8602	19.5103	18.6843	17.7145	16.9380 (92)
Temperature adjustment	16.9943	17.3431	17.8969	18.6041	19.2333	19.6945	19.8909	19.8602	19.5103	18.6843	17.7145	0.0000
adjusted MIT	16.9943	17.3431	17.8969	18.6041	19.2333	19.6945	19.8909	19.8602	19.5103	18.6843	17.7145	16.9380 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9492	0.9223	0.8808	0.8110	0.7093	0.5725	0.4328	0.4789	0.6788	0.8486	0.9284	0.9557 (94)
Ext temp.	635.1371	768.8601	870.6585	925.5285	880.9654	702.7424	507.4962	516.2997	659.9276	691.2701	627.8097	594.2746 (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	2281.4131	2231.2862	2039.1932	1718.3700	1331.3602	892.1480	576.3047	604.9249	950.8137	1428.7303	1883.3323	2269.4212 (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	1224.8294	982.7504	869.3898	570.8459	335.0937	0.0000	0.0000	0.0000	0.0000	548.6704	903.9763	1246.3091 (98)
Space heating												6681.8649 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space heating per m2

(98) / (4) = 48.7514 (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	1646.1247	1295.8854	1328.6429	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6629	0.7292	0.6966	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1091.2951	944.9312	925.5072	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1536.6947	1470.9653	1366.1364	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	320.6877	391.3693	327.8281	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling													
Cooled fraction													1039.8851 (104)
Intermittency factor (Table 10b)									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	80.1719	97.8423	81.9570	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling													259.9713 (107)
Space cooling per m2													1.8968 (108)
Energy for space heating													48.7514 (99)
Energy for space cooling													1.8968 (108)
Total													50.6482 (109)
Dwelling Fabric Energy Efficiency (DFEE)													50.6 (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	53.1200 (1b)	x 2.4000 (2b)	= 127.4880 (1b) - (3b)
First floor	53.1200 (1c)	x 2.6900 (2c)	= 142.8928 (1c) - (3c)
Second floor	30.8200 (1d)	x 2.5000 (2d)	= 77.0500 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	137.0600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 347.4308 (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) =					Air changes per hour 40.0000 / (5) = 0.1151 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3651 (18)
Number of sides sheltered					0 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		1.0000 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3651 (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	0.4655	0.4564	0.4473	0.4016	0.3925	0.3469	0.3469	0.3377	0.3651	0.3925	0.4108	0.4290 (22b)
Effective ac	0.6084	0.6042	0.6000	0.5807	0.5770	0.5602	0.5602	0.5570	0.5667	0.5770	0.5844	0.5920 (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			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.40)			21.7400	1.3258	28.8220		(27)
TER Room Window (Uw = 1.70)			1.4600	1.5918	2.3240		(27a)
150mm EPS B&B			53.1200	0.1300	6.9056		(28a)
140mm Timber Frame	172.8600	21.4100	151.4500	0.1800	27.2610		(29a)
W2V	30.7800		30.7800	0.1800	5.5404		(29a)
Dormer Cheek	10.5100	2.4500	8.0600	0.1800	1.4508		(29a)
400mm Mineral Wool	14.3700		14.3700	0.1300	1.8681		(30)
Sloping	43.0100	1.4600	41.5500	0.1300	5.4015		(30)
Dormer Roof	4.3500		4.3500	0.1300	0.5655		(30)
C2V	22.3000		22.3000	0.1300	2.8990		(30)
Total net area of external elements Aum(A, m ²)			351.3000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		85.1578		(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)							14.8024 (36)
Total fabric heat loss						(33) + (36) =	99.9602 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	69.7503	69.2679	68.7950	66.5738	66.1582	64.2237	64.2237	63.8654	64.9688	66.1582	66.9989	67.8778 (38)
Average = Sum(39)m / 12 =	169.7106	169.2281	168.7552	166.5340	166.1185	164.1839	164.1839	163.8256	164.9291	166.1185	166.9592	167.8381 (39)
												166.5321 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2382	1.2347	1.2313	1.2150	1.2120	1.1979	1.1979	1.1953	1.2033	1.2120	1.2181	1.2246 (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												2.9113 (42)
Average daily hot water use (litres/day)												103.3426 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	113.6769	109.5432	105.4095	101.2758	97.1421	93.0084	93.0084	97.1421	101.2758	105.4095	109.5432	113.6769 (44)
Energy conte	168.5795	147.4407	152.1456	132.6442	127.2753	109.8289	101.7726	116.7856	118.1804	137.7278	150.3407	163.2603 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Energy content (annual)	Total = Sum(45)m = 1625.9817 (45)											
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	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	35.8231	31.3312	32.3309	28.1869	27.0460	23.3386	21.6267	24.8169	25.1133	29.2672	31.9474	34.6928 (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)
(66)m	145.5634	145.5634	145.5634	145.5634	145.5634	145.5634	145.5634	145.5634	145.5634	145.5634	145.5634	145.5634	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.0970	24.9555	20.2952	15.3647	11.4853	9.6964	10.4773	13.6188	18.2791	23.2095	27.0890	28.8779	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	306.0438	309.2195	301.2167	284.1795	262.6732	242.4603	228.9569	225.7811	233.7839	250.8211	272.3274	292.5403	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.5563	37.5563	37.5563	37.5563	37.5563	37.5563	37.5563	37.5563	37.5563	37.5563	37.5563	37.5563	(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)	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	(71)
Water heating gains (Table 5)	48.1494	46.6237	43.4556	39.1485	36.3522	32.4148	29.0681	33.3561	34.8796	39.3376	44.3714	46.6301	(72)
Total internal gains	448.9591	447.4678	431.6364	405.3618	377.1797	351.2405	335.1713	339.4250	353.6117	380.0372	410.4567	434.7173	(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				8.2400	10.6334	0.6300	0.7000		0.7700		26.7776 (74)	
East				4.2500	19.6403	0.6300	0.7000		0.7700		25.5099 (76)	
South				8.6500	46.7521	0.6300	0.7000		0.7700		123.5915 (78)	
West				0.6000	19.6403	0.6300	0.7000		0.7700		3.6014 (80)	
West				1.4600	26.0000	0.6300	0.7000		1.0000		15.0663 (82)	
Solar gains	194.5467	341.8237	494.2061	654.7847	770.7083	781.1547	746.4782	657.7995	549.6043	385.0531	234.9526	165.2262 (83)
Total gains	643.5058	789.2915	925.8425	1060.1465	1147.8880	1132.3952	1081.6495	997.2245	903.2160	765.0903	645.4094	599.9435 (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	56.0841	56.2439	56.4015	57.1538	57.2968	57.9719	57.9719	58.0987	57.7100	57.2968	57.0083	56.7097	
alpha	4.7389	4.7496	4.7601	4.8103	4.8198	4.8648	4.8648	4.8732	4.8473	4.8198	4.8006	4.7806	
util living area	0.9993	0.9980	0.9939	0.9779	0.9254	0.7970	0.6335	0.6973	0.9092	0.9889	0.9984	0.9995	(86)
MIT	19.5224	19.6930	19.9691	20.3375	20.6729	20.8993	20.9748	20.9604	20.7850	20.3421	19.8654	19.4992	(87)
Th 2	19.8895	19.8923	19.8951	19.9080	19.9104	19.9217	19.9217	19.9238	19.9173	19.9104	19.9055	19.9004	(88)
util rest of house	0.9991	0.9973	0.9915	0.9684	0.8911	0.7077	0.4951	0.5612	0.8530	0.9827	0.9978	0.9993	(89)
MIT 2	18.5389	18.7115	18.9886	19.3618	19.6793	19.8725	19.9150	19.9118	19.7891	19.3719	18.8943	18.5243	(90)
Living area fraction	fLA = Living area / (4) =												0.1213 (91)
MIT	18.6581	18.8305	19.1075	19.4801	19.7998	19.9971	20.0435	20.0389	19.9098	19.4895	19.0121	18.6425	(92)
Temperature adjustment													0.0000
adjusted MIT	18.6581	18.8305	19.1075	19.4801	19.7998	19.9971	20.0435	20.0389	19.9098	19.4895	19.0121	18.6425	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9987	0.9963	0.9891	0.9635	0.8868	0.7148	0.5118	0.5772	0.8525	0.9793	0.9970	0.9991	(94)
Ext temp.	642.6443	786.3810	915.7959	1021.4546	1017.9240	809.4732	553.6128	575.6104	770.0105	749.2497	643.4426	599.3738	(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	2436.7290	2357.4283	2127.5793	1761.9492	1345.5285	886.1095	565.3679	596.1512	958.2119	1476.7172	1988.8320	2424.0008	(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	1334.7991	1055.7438	901.5668	533.1561	243.7378	0.0000	0.0000	0.0000	0.0000	541.2359	968.6803	1357.5225	(98)
Space heating per m2	(98) / (4) =												50.6088 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1543.3286	1214.9608	1245.0749	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7950	0.8738	0.8383	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1226.9395	1061.6815	1043.7796	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1425.6124	1364.6087	1271.4907	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	143.0445	225.3779	169.4171	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												537.8395	(104)
Cooled fraction									FC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	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	35.7611	56.3445	42.3543	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling												134.4599	(107)
Space cooling per m2												0.9810	(108)
Energy for space heating												50.6088	(99)
Energy for space cooling												0.9810	(108)
Total												51.5898	(109)
Target Fabric Energy Efficiency (TFEE)												59.3	(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	53.1200 (1b)	x 2.4000 (2b)	= 127.4880 (1b) - (3b)
First floor	53.1200 (1c)	x 2.6900 (2c)	= 142.8928 (1c) - (3c)
Second floor	30.8200 (1d)	x 2.5000 (2d)	= 77.0500 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	137.0600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 347.4308 (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							0 * 10 =	0.0000 (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) =						0.0000 / (5) =	0.0000 (8)				
Pressure test							Yes					
Measured/design AP50							4.3600					
Infiltration rate							0.2180	(18)				
Number of sides sheltered							0	(19)				
Shelter factor							(20) = 1 - [0.075 x (19)] =	1.0000 (20)				
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.2180 (21)				
Wind speed	Jan 4.4000	Feb 4.1000	Mar 4.1000	Apr 3.9000	May 3.9000	Jun 3.7000	Jul 3.7000	Aug 3.5000	Sep 3.5000	Oct 3.8000	Nov 3.7000	Dec 3.9000 (22)
Wind factor	1.1000	1.0250	1.0250	0.9750	0.9750	0.9250	0.9250	0.8750	0.8750	0.9500	0.9250	0.9750 (22a)
Adj infilt rate	0.2398	0.2235	0.2235	0.2126	0.2126	0.2017	0.2017	0.1908	0.1908	0.2071	0.2017	0.2126 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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			2.1200	1.3000	2.7560		(26)
Window (Uw = 1.40)			17.2200	1.3258	22.8295		(27)
French Door (Uw = 1.40)			4.5200	1.3258	5.9924		(27)
Roof Window (Uw = 1.80)			1.4600	1.6791	2.4515		(27a)
150mm EPS B&B			53.1200	0.1800	9.5616	75.0000	3984.0000 (28a)
140mm Timber Frame	172.8600	21.4100	151.4500	0.1900	28.7755	9.0000	1363.0500 (29a)
W2V	30.7800		30.7800	0.1400	4.3092	18.0000	554.0400 (29a)
Dormer Cheek	10.5100	2.4500	8.0600	0.3200	2.5792	18.0000	145.0800 (29a)
400mm Mineral Wool	14.3700		14.3700	0.1100	1.5807	9.0000	129.3300 (30)
Sloping	43.0100	1.4600	41.5500	0.2000	8.3100	9.0000	373.9500 (30)
Dormer Roof	4.3500		4.3500	0.2800	1.2180	9.0000	39.1500 (30)
C2V	22.3000		22.3000	0.1400	3.1220	9.0000	200.7000 (30)
Total net area of external elements Aum(A, m ²)			351.3000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	93.4857	(33)
Timber GF			74.7800			9.0000	673.0200 (32c)
Timber FF			135.1700			9.0000	1216.5300 (32c)
Timber 2F			38.0200			9.0000	342.1800 (32c)
Internal Floor			53.1200			18.0000	956.1600 (32d)
Internal Floor 2			30.8200			18.0000	554.7600 (32d)
Internal Ceiling			53.1200			18.0000	956.1600 (32e)
Internal Ceiling 2			30.8200			18.0000	554.7600 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 12042.8700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 87.8657 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 18.5664 (36)
Total fabric heat loss (33) + (36) = 112.0520 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan 57.3261	Feb 57.3261	Mar 57.3261	Apr 57.3261	May 57.3261	Jun 57.3261	Jul 57.3261	Aug 57.3261	Sep 57.3261	Oct 57.3261	Nov 57.3261	Dec 57.3261 (38)
Heat transfer coeff	169.3781	169.3781	169.3781	169.3781	169.3781	169.3781	169.3781	169.3781	169.3781	169.3781	169.3781	169.3781 (39)
Average = Sum(39)m / 12 =												169.3781 (39)

HLP	Jan 1.2358	Feb 1.2358	Mar 1.2358	Apr 1.2358	May 1.2358	Jun 1.2358	Jul 1.2358	Aug 1.2358	Sep 1.2358	Oct 1.2358	Nov 1.2358	Dec 1.2358 (40)
HLP (average)												1.2358 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9113 (42)
Average daily hot water use (litres/day)												103.3426 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	113.6769	109.5432	105.4095	101.2758	97.1421	93.0084	93.0084	97.1421	101.2758	105.4095	109.5432	113.6769 (44)
Energy content	168.5795	147.4407	152.1456	132.6442	127.2753	109.8289	101.7726	116.7856	118.1804	137.7278	150.3407	163.2603 (45)
Energy content (annual)												Total = Sum(45)m = 1625.9817 (45)
Distribution loss (46)m = 0.15 x (45)m	25.2869	22.1161	22.8218	19.8966	19.0913	16.4743	15.2659	17.5178	17.7271	20.6592	22.5511	24.4890 (46)
Water storage loss:												
Store volume												210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.4200 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7668 (55)
Total storage loss	23.7708	21.4704	23.7708	23.0040	23.7708	23.0040	23.7708	23.7708	23.0040	23.7708	23.0040	23.7708 (56)
If cylinder contains dedicated solar storage	23.7708	21.4704	23.7708	23.0040	23.7708	23.0040	23.7708	23.7708	23.0040	23.7708	23.0040	23.7708 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	215.6127	189.9223	199.1788	178.1602	174.3085	155.3449	148.8058	163.8188	163.6964	184.7610	195.8567	210.2935 (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)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h	215.6127	189.9223	199.1788	178.1602	174.3085	155.3449	148.8058	163.8188	163.6964	184.7610	195.8567	210.2935 (64)
Total per year (kWh/year) = Sum(64)m =												2179.7597 (64)
RHI water heating demand												2180 (64)
Heat gains from water heating, kWh/month	93.6792	83.0093	88.2150	80.5170	79.9456	72.9309	71.4660	76.4578	75.7078	83.4211	86.4011	91.9106 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	174.6761	174.6761	174.6761	174.6761	174.6761	174.6761	174.6761	174.6761	174.6761	174.6761	174.6761	174.6761 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	70.2425	62.3887	50.7379	38.4119	28.7133	24.2410	26.1933	34.0470	45.6978	58.0238	67.7224	72.1947 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	456.7817	461.5217	449.5771	424.1486	392.0496	361.8811	341.7267	336.9867	348.9313	374.3598	406.4588	436.6273 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.3789	55.3789	55.3789	55.3789	55.3789	55.3789	55.3789	55.3789	55.3789	55.3789	55.3789	55.3789 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507 (71)
Water heating gains (Table 5)	125.9130	123.5258	118.5685	111.8292	107.4538	101.2929	96.0564	102.7658	105.1497	112.1251	120.0015	123.5357 (72)
Total internal gains	769.5414	764.0404	735.4878	690.9939	644.8209	604.0192	580.5805	590.4037	616.3830	661.1130	710.7869	748.9620 (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				8.2400	13.4839	0.7200	0.7000		0.7700		38.8067 (74)	
East				4.2500	25.1925	0.7200	0.7000		0.7700		37.3960 (76)	
South				4.1300	56.7559	0.7200	0.7000		0.7700		81.8700 (78)	
West				0.6000	25.1925	0.7200	0.7000		0.7700		5.2794 (80)	
South				4.5200	56.7559	0.7200	0.7000		0.7700		89.6010 (78)	
West				1.4600	34.0000	0.6300	0.7000		1.0000		19.7021 (82)	
Solar gains	272.6551	407.8043	595.5299	797.0064	890.0797	990.4187	912.6056	837.0380	695.3051	489.5894	328.2007	219.2227 (83)
Total gains	1042.1965	1171.8447	1331.0177	1488.0002	1534.9007	1594.4379	1493.1861	1427.4418	1311.6880	1150.7024	1038.9876	968.1847 (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	19.7501	19.7501	19.7501	19.7501	19.7501	19.7501	19.7501	19.7501	19.7501	19.7501	19.7501	19.7501
alpha	2.3167	2.3167	2.3167	2.3167	2.3167	2.3167	2.3167	2.3167	2.3167	2.3167	2.3167	2.3167
util living area	0.9265	0.9039	0.8552	0.7724	0.6493	0.4727	0.3493	0.3632	0.5864	0.7893	0.8934	0.9350 (86)
MIT	18.7155	18.9586	19.4586	20.0275	20.5348	20.8500	20.9491	20.9447	20.7325	20.1606	19.3569	18.6565 (87)
Th 2	19.8915	19.8915	19.8915	19.8915	19.8915	19.8915	19.8915	19.8915	19.8915	19.8915	19.8915	19.8915 (88)
util rest of house	0.9160	0.8905	0.8345	0.7387	0.5931	0.3885	0.2411	0.2514	0.5056	0.7489	0.8756	0.9255 (89)
MIT 2	16.8985	17.2449	17.9536	18.7418	19.4127	19.7784	19.8691	19.8670	19.6629	18.9438	17.8229	16.8155 (90)
Living area fraction												fLA = Living area / (4) = 0.1213 (91)
MIT	17.1189	17.4527	18.1361	18.8977	19.5488	19.9084	20.0001	19.9977	19.7926	19.0914	18.0089	17.0387 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.9689	17.3027	17.9861	18.7477	19.3988	19.7584	19.8501	19.8477	19.6426	18.9414	17.8589	16.8887 (93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF HEAT DEMAND 09 Jan 2014

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8763	0.8473	0.7886	0.6970	0.5648	0.3776	0.2368	0.2468	0.4852	0.7060	0.8309	0.8877	(94)
Useful gains	913.3167	992.9008	1049.6933	1037.1393	866.9790	602.0012	353.6016	352.2289	636.3980	812.3577	863.3109	859.4758	(95)
Ext temp.	5.4000	5.9000	7.6000	10.0000	13.1000	15.9000	17.7000	17.7000	15.3000	12.0000	8.4000	5.5000	(96)
Heat loss rate W													
	1959.5143	1931.3683	1759.1781	1481.6661	1066.8712	653.5243	364.1766	363.7710	735.5413	1175.7131	1602.1270	1928.9965	(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													
	778.3710	630.6501	527.8567	320.0593	148.7198	0.0000	0.0000	0.0000	0.0000	270.3364	531.9475	795.7234	(98)
Space heating												4003.6644	(98)
RHI space heating demand												4004	(98)

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	53.1200 (1b)	x 2.4000 (2b)	= 127.4880 (1b) - (3b)
First floor	53.1200 (1c)	x 2.6900 (2c)	= 142.8928 (1c) - (3c)
Second floor	30.8200 (1d)	x 2.5000 (2d)	= 77.0500 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	137.0600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 347.4308 (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							0 * 10 =	0.0000 (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) =						0.0000 / (5) =	0.0000 (8)				
Pressure test							Yes					
Measured/design AP50							4.3600					
Infiltration rate							0.2180	(18)				
Number of sides sheltered							0	(19)				
Shelter factor							(20) = 1 - [0.075 x (19)] =	1.0000 (20)				
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.2180 (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)
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												
	0.2780	0.2725	0.2671	0.2398	0.2344	0.2071	0.2071	0.2017	0.2180	0.2344	0.2453	0.2562 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5280	0.5225	0.5171	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5062 (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			2.1200	1.3000	2.7560		(26)
Window (Uw = 1.40)			17.2200	1.3258	22.8295		(27)
French Door (Uw = 1.40)			4.5200	1.3258	5.9924		(27)
Roof Window (Uw = 1.80)			1.4600	1.6791	2.4515		(27a)
150mm EPS B&B			53.1200	0.1800	9.5616	75.0000	3984.0000 (28a)
140mm Timber Frame	172.8600	21.4100	151.4500	0.1900	28.7755	9.0000	1363.0500 (29a)
W2V	30.7800		30.7800	0.1400	4.3092	18.0000	554.0400 (29a)
Dormer Cheek	10.5100	2.4500	8.0600	0.3200	2.5792	18.0000	145.0800 (29a)
400mm Mineral Wool	14.3700		14.3700	0.1100	1.5807	9.0000	129.3300 (30)
Sloping	43.0100	1.4600	41.5500	0.2000	8.3100	9.0000	373.9500 (30)
Dormer Roof	4.3500		4.3500	0.2800	1.2180	9.0000	39.1500 (30)
C2V	22.3000		22.3000	0.1400	3.1220	9.0000	200.7000 (30)
Total net area of external elements Aum(A, m ²)			351.3000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	93.4857		(33)
Timber GF			74.7800			9.0000	673.0200 (32c)
Timber FF			135.1700			9.0000	1216.5300 (32c)
Timber 2F			38.0200			9.0000	342.1800 (32c)
Internal Floor			53.1200			18.0000	956.1600 (32d)
Internal Floor 2			30.8200			18.0000	554.7600 (32d)
Internal Ceiling			53.1200			18.0000	956.1600 (32e)
Internal Ceiling 2			30.8200			18.0000	554.7600 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 12042.8700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 87.8657 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 18.5664 (36)
Total fabric heat loss (33) + (36) = 112.0520 (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	60.5306	59.9058	59.2809	57.3261	57.3261	57.3261	57.3261	57.3261	57.3261	57.3261	57.3261	58.0312 (38)
Heat transfer coeff	172.5826	171.9578	171.3329	169.3781	169.3781	169.3781	169.3781	169.3781	169.3781	169.3781	169.3781	170.0832 (39)
Average = Sum(39)m / 12 =												170.0818 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2592	1.2546	1.2501	1.2358	1.2358	1.2358	1.2358	1.2358	1.2358	1.2358	1.2358	1.2409 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.9113 (42)											
Average daily hot water use (litres/day)	103.3426 (43)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	113.6769	109.5432	105.4095	101.2758	97.1421	93.0084	93.0084	97.1421	101.2758	105.4095	109.5432	113.6769 (44)
Energy content	168.5795	147.4407	152.1456	132.6442	127.2753	109.8289	101.7726	116.7856	118.1804	137.7278	150.3407	163.2603 (45)
Energy content (annual)	Total = Sum(45)m =											1625.9817 (45)
Distribution loss (46)m = 0.15 x (45)m	25.2869	22.1161	22.8218	19.8966	19.0913	16.4743	15.2659	17.5178	17.7271	20.6592	22.5511	24.4890 (46)
Water storage loss:												
Store volume	210.0000 (47)											
a) If manufacturer declared loss factor is known (kWh/day):	1.4200 (48)											
Temperature factor from Table 2b	0.5400 (49)											
Enter (49) or (54) in (55)	0.7668 (55)											
Total storage loss	23.7708	21.4704	23.7708	23.0040	23.7708	23.0040	23.7708	23.7708	23.0040	23.7708	23.0040	23.7708 (56)
If cylinder contains dedicated solar storage	23.7708	21.4704	23.7708	23.0040	23.7708	23.0040	23.7708	23.7708	23.0040	23.7708	23.0040	23.7708 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	215.6127	189.9223	199.1788	178.1602	174.3085	155.3449	148.8058	163.8188	163.6964	184.7610	195.8567	210.2935 (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)
Solar input (sum of months) = Sum(63)m =	0.0000 (63)											
Output from w/h	215.6127	189.9223	199.1788	178.1602	174.3085	155.3449	148.8058	163.8188	163.6964	184.7610	195.8567	210.2935 (64)
Total per year (kWh/year) = Sum(64)m =	2179.7597 (64)											
Heat gains from water heating, kWh/month	93.6792	83.0093	88.2150	80.5170	79.9456	72.9309	71.4660	76.4578	75.7078	83.4211	86.4011	91.9106 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	174.6761	174.6761	174.6761	174.6761	174.6761	174.6761	174.6761	174.6761	174.6761	174.6761	174.6761	174.6761 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	70.2425	62.3887	50.7379	38.4119	28.7133	24.2410	26.1933	34.0470	45.6978	58.0238	67.7224	72.1947 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	456.7817	461.5217	449.5771	424.1486	392.0496	361.8811	341.7267	336.9867	348.9313	374.3598	406.4588	436.6273 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.3789	55.3789	55.3789	55.3789	55.3789	55.3789	55.3789	55.3789	55.3789	55.3789	55.3789	55.3789 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507 (71)
Water heating gains (Table 5)	125.9130	123.5258	118.5685	111.8292	107.4538	101.2929	96.0564	102.7658	105.1497	112.1251	120.0015	123.5357 (72)
Total internal gains	769.5414	764.0404	735.4878	690.9939	644.8209	604.0192	580.5805	590.4037	616.3830	661.1130	710.7869	748.9620 (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				8.2400	10.6334		0.7200		0.7000		0.7700		30.6029 (74)
East				4.2500	19.6403		0.7200		0.7000		0.7700		29.1541 (76)
South				4.1300	46.7521		0.7200		0.7000		0.7700		67.4395 (78)
West				0.6000	19.6403		0.7200		0.7000		0.7700		4.1159 (80)
South				4.5200	46.7521		0.7200		0.7000		0.7700		73.8079 (78)
West				1.4600	26.0000		0.6300		0.7000		1.0000		15.0663 (82)
Solar gains	220.1867	386.1855	556.8599	735.9081	864.9153	876.1918	837.4721	738.7741	618.5993	434.5970	265.7855		187.0915 (83)
Total gains	989.7281	1150.2259	1292.3477	1426.9019	1509.7362	1480.2111	1418.0526	1329.1778	1234.9823	1095.7100	976.5724		936.0535 (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	19.3834	19.4539	19.5248	19.7501	19.7501	19.7501	19.7501	19.7501	19.7501	19.7501	19.7501	19.6683
alpha	2.2922	2.2969	2.3017	2.3167	2.3167	2.3167	2.3167	2.3167	2.3167	2.3167	2.3167	2.3112
util living area	0.9416	0.9177	0.8795	0.8122	0.7132	0.5845	0.4618	0.5014	0.6790	0.8413	0.9195	0.9477 (86)
MIT	18.3653	18.6820	19.1732	19.7867	20.3208	20.7018	20.8769	20.8464	20.5502	19.8560	19.0157	18.3206 (87)
Th 2	19.8730	19.8766	19.8802	19.8915	19.8915	19.8915	19.8915	19.8915	19.8915	19.8915	19.8915	19.8874 (88)
util rest of house	0.9335	0.9066	0.8627	0.7848	0.6685	0.5133	0.3644	0.4043	0.6149	0.8122	0.9067	0.9405 (89)
MIT 2	16.3837	16.8394	17.5426	18.4112	19.1368	19.6192	19.8102	19.7838	19.4493	18.5269	17.3349	16.3266 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	16.6240	17.0628	17.7403	18.5780	19.2803	19.7505	19.9395	19.9127	19.5828	18.6880	17.5387	16.5684 (92)
Temperature adjustment	-0.1500											
adjusted MIT	16.4740	16.9128	17.5903	18.4280	19.1303	19.6005	19.7895	19.7627	19.4328	18.5380	17.3887	16.4184 (93)

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Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8972	0.8649	0.8170	0.7402	0.6328	0.4925	0.3547	0.3919	0.5840	0.7662	0.8654	0.9063	(94)
Useful gains	887.9610	994.8538	1055.8891	1056.2009	955.3996	729.0551	502.9584	520.9349	721.1991	839.5577	845.0831	848.3731	(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	2101.0142	2065.6954	1900.1359	1613.8300	1258.5379	846.9774	540.2326	569.5600	903.2594	1344.5305	1742.6887	2078.1403	(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	902.5116	719.6056	628.1196	401.4929	225.5349	0.0000	0.0000	0.0000	0.0000	375.6998	646.2761	914.9468	(98)
Space heating												4814.1873	(98)
Space heating per m2												(98) / (4) =	35.1247 (99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.6000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													5313.6725 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	902.5116	719.6056	628.1196	401.4929	225.5349	0.0000	0.0000	0.0000	0.0000	375.6998	646.2761	914.9468	(98)
Space heating efficiency (main heating system 1)	90.6000	90.6000	90.6000	90.6000	90.6000	0.0000	0.0000	0.0000	0.0000	90.6000	90.6000	90.6000	(210)
Space heating fuel (main heating system)	996.1496	794.2667	693.2887	443.1489	248.9347	0.0000	0.0000	0.0000	0.0000	414.6796	713.3290	1009.8751	(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	215.6127	189.9223	199.1788	178.1602	174.3085	155.3449	148.8058	163.8188	163.6964	184.7610	195.8567	210.2935	(64)
Efficiency of water heater	88.3193	88.1354	87.7701	87.0183	85.6025	79.9000	79.9000	79.9000	79.9000	86.7694	87.8635	88.3879	(216)
(217)m	88.3193	88.1354	87.7701	87.0183	85.6025	79.9000	79.9000	79.9000	79.9000	86.7694	87.8635	88.3879	(217)
Fuel for water heating, kWh/month	244.1288	215.4893	226.9323	204.7388	203.6255	194.4242	186.2401	205.0298	204.8766	212.9334	222.9103	237.9212	(219)
Water heating fuel used												2559.2502	(219)
Annual totals kWh/year													
Space heating fuel - main system												5313.6725	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 12.2330, total flow = 53.0000, SFP = 0.2308)													
mechanical ventilation fans (SFP = 0.2308)													97.8330 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													172.8330 (231)
Electricity for lighting (calculated in Appendix L)													496.2015 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.99 * 1068 * 1.00) =										-845.9118		-845.9118	(233)
Total delivered energy for all uses												7696.0453	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	5313.6725	3.4800	184.9158	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	2559.2502	3.4800	89.0619	(247)
Mechanical ventilation fans	97.8330	13.1900	12.9042	(249)
Pumps and fans for heating	75.0000	13.1900	9.8925	(249)
Energy for lighting	496.2015	13.1900	65.4490	(250)
Additional standing charges			120.0000	(251)
Energy saving/generation technologies				
PV Unit	-845.9118	13.1900	-111.5758	(252)
Total energy cost			370.6476	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):			0.4200 (256)
Energy cost factor (ECF)			0.8551 (257)
SAP value		[(255) x (256)] / [(4) + 45.0] =	88.0719
SAP rating (Section 12)			88 (258)
SAP band			B

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	5313.6725	0.2160	1147.7533 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2559.2502	0.2160	552.7980 (264)
Space and water heating			1700.5513 (265)
Pumps and fans	172.8330	0.5190	89.7003 (267)
Energy for lighting	496.2015	0.5190	257.5286 (268)
Energy saving/generation technologies			
PV Unit	-845.9118	0.5190	-439.0282 (269)
Total kg/year			1608.7519 (272)
CO2 emissions per m2			11.7400 (273)
EI value			88.1592
EI rating			88 (274)
EI band			B

Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9060 = 3.841$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9060 = 0.2384$, stars = 4
Water heating energy efficiency	$3.48 / 0.8496 = 4.096$, stars = 4
Water heating environmental impact	$0.216 / 0.8496 = 0.2543$, stars = 4

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	53.1200 (1b)	x 2.4000 (2b)	= 127.4880 (1b) - (3b)
First floor	53.1200 (1c)	x 2.6900 (2c)	= 142.8928 (1c) - (3c)
Second floor	30.8200 (1d)	x 2.5000 (2d)	= 77.0500 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	137.0600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 347.4308 (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												0 * 10 =	0.0000 (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) =										0.0000 / (5) =	0.0000 (8)	
Pressure test											Yes		
Measured/design AP50											4.3600		
Infiltration rate											0.2180 (18)		
Number of sides sheltered											0 (19)		
Shelter factor											(20) = 1 - [0.075 x (19)] =	1.0000 (20)	
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.2180 (21)	
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	4.4000	4.1000	4.1000	3.9000	3.9000	3.7000	3.7000	3.5000	3.5000	3.8000	3.7000	3.9000	(22)
Adj infilt rate	1.1000	1.0250	1.0250	0.9750	0.9750	0.9250	0.9250	0.8750	0.8750	0.9500	0.9250	0.9750	(22a)
	0.2398	0.2235	0.2235	0.2126	0.2126	0.2017	0.2017	0.1908	0.1908	0.2071	0.2017	0.2126	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation:													0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(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			2.1200	1.3000	2.7560		(26)					
Window (Uw = 1.40)			17.2200	1.3258	22.8295		(27)					
French Door (Uw = 1.40)			4.5200	1.3258	5.9924		(27)					
Roof Window (Uw = 1.80)			1.4600	1.6791	2.4515		(27a)					
150mm EPS B&B			53.1200	0.1800	9.5616	75.0000	3984.0000 (28a)					
140mm Timber Frame	172.8600	21.4100	151.4500	0.1900	28.7755	9.0000	1363.0500 (29a)					
W2V	30.7800		30.7800	0.1400	4.3092	18.0000	554.0400 (29a)					
Dormer Cheek	10.5100	2.4500	8.0600	0.3200	2.5792	18.0000	145.0800 (29a)					
400mm Mineral Wool	14.3700		14.3700	0.1100	1.5807	9.0000	129.3300 (30)					
Sloping	43.0100	1.4600	41.5500	0.2000	8.3100	9.0000	373.9500 (30)					
Dormer Roof	4.3500		4.3500	0.2800	1.2180	9.0000	39.1500 (30)					
C2V	22.3000		22.3000	0.1400	3.1220	9.0000	200.7000 (30)					
Total net area of external elements Aum(A, m2)			351.3000				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	93.4857		(33)					
Timber GF			74.7800			9.0000	673.0200 (32c)					
Timber FF			135.1700			9.0000	1216.5300 (32c)					
Timber 2F			38.0200			9.0000	342.1800 (32c)					
Internal Floor			53.1200			18.0000	956.1600 (32d)					
Internal Floor 2			30.8200			18.0000	554.7600 (32d)					
Internal Ceiling			53.1200			18.0000	956.1600 (32e)					
Internal Ceiling 2			30.8200			18.0000	554.7600 (32e)					
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			12042.8700 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							87.8657 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							18.5664 (36)					
Total fabric heat loss					(33) + (36) =		112.0520 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 57.3261	Feb 57.3261	Mar 57.3261	Apr 57.3261	May 57.3261	Jun 57.3261	Jul 57.3261	Aug 57.3261	Sep 57.3261	Oct 57.3261	Nov 57.3261	Dec 57.3261 (38)
Heat transfer coeff	169.3781	169.3781	169.3781	169.3781	169.3781	169.3781	169.3781	169.3781	169.3781	169.3781	169.3781	169.3781 (39)
Average = Sum(39)m / 12 =												
HLP	Jan 1.2358	Feb 1.2358	Mar 1.2358	Apr 1.2358	May 1.2358	Jun 1.2358	Jul 1.2358	Aug 1.2358	Sep 1.2358	Oct 1.2358	Nov 1.2358	Dec 1.2358 (40)
HLP (average)												
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9113 (42)
Average daily hot water use (litres/day)												103.3426 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	113.6769	109.5432	105.4095	101.2758	97.1421	93.0084	93.0084	97.1421	101.2758	105.4095	109.5432	113.6769 (44)
Energy content	168.5795	147.4407	152.1456	132.6442	127.2753	109.8289	101.7726	116.7856	118.1804	137.7278	150.3407	163.2603 (45)
Energy content (annual)												Total = Sum(45)m = 1625.9817 (45)
Distribution loss (46)m = 0.15 x (45)m	25.2869	22.1161	22.8218	19.8966	19.0913	16.4743	15.2659	17.5178	17.7271	20.6592	22.5511	24.4890 (46)
Water storage loss:												210.0000 (47)
Store volume												1.4200 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.7668 (55)
Enter (49) or (54) in (55)												
Total storage loss	23.7708	21.4704	23.7708	23.0040	23.7708	23.0040	23.7708	23.7708	23.0040	23.7708	23.0040	23.7708 (56)
If cylinder contains dedicated solar storage	23.7708	21.4704	23.7708	23.0040	23.7708	23.0040	23.7708	23.7708	23.0040	23.7708	23.0040	23.7708 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	215.6127	189.9223	199.1788	178.1602	174.3085	155.3449	148.8058	163.8188	163.6964	184.7610	195.8567	210.2935 (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)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h	215.6127	189.9223	199.1788	178.1602	174.3085	155.3449	148.8058	163.8188	163.6964	184.7610	195.8567	210.2935 (64)
Total per year (kWh/year) = Sum(64)m =												2179.7597 (64)
Heat gains from water heating, kWh/month	93.6792	83.0093	88.2150	80.5170	79.9456	72.9309	71.4660	76.4578	75.7078	83.4211	86.4011	91.9106 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	174.6761	174.6761	174.6761	174.6761	174.6761	174.6761	174.6761	174.6761	174.6761	174.6761	174.6761	174.6761 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	70.2425	62.3887	50.7379	38.4119	28.7133	24.2410	26.1933	34.0470	45.6978	58.0238	67.7224	72.1947 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	456.7817	461.5217	449.5771	424.1486	392.0496	361.8811	341.7267	336.9867	348.9313	374.3598	406.4588	436.6273 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.3789	55.3789	55.3789	55.3789	55.3789	55.3789	55.3789	55.3789	55.3789	55.3789	55.3789	55.3789 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507 (71)
Water heating gains (Table 5)	125.9130	123.5258	118.5685	111.8292	107.4538	101.2929	96.0564	102.7658	105.1497	112.1251	120.0015	123.5357 (72)
Total internal gains	769.5414	764.0404	735.4878	690.9939	644.8209	604.0192	580.5805	590.4037	616.3830	661.1130	710.7869	748.9620 (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				8.2400	13.4839	0.7200	0.7000		0.7700		38.8067 (74)	
East				4.2500	25.1925	0.7200	0.7000		0.7700		37.3960 (76)	
South				4.1300	56.7559	0.7200	0.7000		0.7700		81.8700 (78)	
West				0.6000	25.1925	0.7200	0.7000		0.7700		5.2794 (80)	
South				4.5200	56.7559	0.7200	0.7000		0.7700		89.6010 (78)	
West				1.4600	34.0000	0.6300	0.7000		1.0000		19.7021 (82)	
Solar gains	272.6551	407.8043	595.5299	797.0064	890.0797	990.4187	912.6056	837.0380	695.3051	489.5894	328.2007	219.2227 (83)
Total gains	1042.1965	1171.8447	1331.0177	1488.0002	1534.9007	1594.4379	1493.1861	1427.4418	1311.6880	1150.7024	1038.9876	968.1847 (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	19.7501	19.7501	19.7501	19.7501	19.7501	19.7501	19.7501	19.7501	19.7501	19.7501	19.7501	19.7501
alpha	2.3167	2.3167	2.3167	2.3167	2.3167	2.3167	2.3167	2.3167	2.3167	2.3167	2.3167	2.3167
util living area	0.9265	0.9039	0.8552	0.7724	0.6493	0.4727	0.3493	0.3632	0.5864	0.7893	0.8934	0.9350 (86)
MIT	18.7155	18.9586	19.4586	20.0275	20.5348	20.8500	20.9491	20.9447	20.7325	20.1606	19.3569	18.6565 (87)
Th 2	19.8915	19.8915	19.8915	19.8915	19.8915	19.8915	19.8915	19.8915	19.8915	19.8915	19.8915	19.8915 (88)
util rest of house	0.9160	0.8905	0.8345	0.7387	0.5931	0.3885	0.2411	0.2514	0.5056	0.7489	0.8756	0.9255 (89)
MIT 2	16.8985	17.2449	17.9536	18.7418	19.4127	19.7784	19.8691	19.8670	19.6629	18.9438	17.8229	16.8155 (90)
Living area fraction												fLA = Living area / (4) = 0.1213 (91)
MIT	17.1189	17.4527	18.1361	18.8977	19.5488	19.9084	20.0001	19.9977	19.7926	19.0914	18.0089	17.0387 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.9689	17.3027	17.9861	18.7477	19.3988	19.7584	19.8501	19.8477	19.6426	18.9414	17.8589	16.8887 (93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8763	0.8473	0.7886	0.6970	0.5648	0.3776	0.2368	0.2468	0.4852	0.7060	0.8309	0.8877	(94)
Useful gains	913.3167	992.9008	1049.6933	1037.1393	866.9790	602.0012	353.6016	352.2289	636.3980	812.3577	863.3109	859.4758	(95)
Ext temp.	5.4000	5.9000	7.6000	10.0000	13.1000	15.9000	17.7000	17.7000	15.3000	12.0000	8.4000	5.5000	(96)
Heat loss rate W													
1959.5143	1931.3683	1759.1781	1481.6661	1066.8712	653.5243	364.1766	363.7710	735.5413	1175.7131	1602.1270	1928.9965	1928.9965	(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													
778.3710	630.6501	527.8567	320.0593	148.7198	0.0000	0.0000	0.0000	0.0000	270.3364	531.9475	795.7234	795.7234	(98)
Space heating												4003.6644	(98)
Space heating per m2												(98) / (4) =	29.2110 (99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.6000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													4419.0556 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	778.3710	630.6501	527.8567	320.0593	148.7198	0.0000	0.0000	0.0000	0.0000	270.3364	531.9475	795.7234	(98)
Space heating efficiency (main heating system 1)	90.6000	90.6000	90.6000	90.6000	90.6000	0.0000	0.0000	0.0000	0.0000	90.6000	90.6000	90.6000	(210)
Space heating fuel (main heating system)	859.1292	696.0818	582.6233	353.2664	164.1499	0.0000	0.0000	0.0000	0.0000	298.3845	587.1385	878.2819	(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	215.6127	189.9223	199.1788	178.1602	174.3085	155.3449	148.8058	163.8188	163.6964	184.7610	195.8567	210.2935	(64)
Efficiency of water heater	88.0424	87.8762	87.3937	86.4596	84.4942	79.9000	79.9000	79.9000	79.9000	85.9283	87.4485	88.1329	(216)
(217)m	244.8963	216.1248	227.9098	206.0618	206.2964	194.4242	186.2401	205.0298	204.8766	215.0178	223.9680	238.6096	(219)
Fuel for water heating, kWh/month												2569.4550	(219)
Water heating fuel used													
Annual totals kWh/year													
Space heating fuel - main system												4419.0556	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 12.2330, total flow = 53.0000, SFP = 0.2308)													
mechanical ventilation fans (SFP = 0.2308)													97.8330 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													172.8330 (231)
Electricity for lighting (calculated in Appendix L)													496.2015 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.99 * 1179 * 1.00) =										-933.8290		-933.8290	(233)
Total delivered energy for all uses												6723.7161	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	4419.0556	10.2300	452.0694	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	2569.4550	10.2300	262.8552	(247)
Mechanical ventilation fans	97.8330	36.7200	35.9243	(249)
Pumps and fans for heating	75.0000	36.7200	27.5400	(249)
Energy for lighting	496.2015	36.7200	182.2052	(250)
Additional standing charges			103.0000	(251)
Energy saving/generation technologies				
PV Unit	-933.8290	36.7200	-342.9020	(252)
Total energy cost			720.6921	(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	4419.0556	0.2160	954.5160	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2569.4550	0.2160	555.0023	(264)
Space and water heating			1509.5183	(265)
Pumps and fans	172.8330	0.5190	89.7003	(267)
Energy for lighting	496.2015	0.5190	257.5286	(268)
Energy saving/generation technologies				

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PV Unit	-933.8290	0.5190	-484.6572 (269)
Total kg/year			1372.0899 (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	4419.0556	1.2200	5391.2478 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2569.4550	1.2200	3134.7351 (264)
Space and water heating			8525.9829 (265)
Pumps and fans	172.8330	3.0700	530.5972 (267)
Energy for lighting	496.2015	3.0700	1523.3385 (268)
Energy saving/generation technologies			
PV Unit	-933.8290	3.0700	-2866.8549 (269)
Primary energy kWh/year			7713.0638 (272)
Primary energy kWh/m2/year			56.2751 (273)

SAP 2012 EPC IMPROVEMENTS

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

(For testing purposes):

A	Not considered
B	Not considered
C	Not considered
D	Not considered
E Low energy lighting	Already installed
F	Not considered
G	Not considered
H	Not considered
I	Not considered
J	Not considered
K	Not considered
M	Not considered
N Solar water heating	Recommended
O	Not considered
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U Solar photovoltaic panels	Already installed
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
N Solar water heating	+ 1.3	-£ 121	-269 kg (19.6%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£121 1.96 kg/m²	B 89	B 90
Total Savings	£121 1.96 kg/m²		

Potential energy efficiency rating:	B 89
Potential environmental impact rating:	B 90

Fuel prices for cost data on this page from database revision number 531 TEST (31 Oct 2023)
 Recommendation texts revision number 4.9c (22 Feb 2014)

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

	Current	Potential	Saving
Electricity	£246	£264	-£18
Mains gas	£818	£678	£140
Space heating	£619	£621	-£2
Water heating	£263	£139	£124
Lighting	£182	£182	£0
Generated (PV)	-£343	-£343	£0
Total cost of fuels	£721	£599	£122
Total cost of uses	£721	£599	£122
Delivered energy	49 kWh/m²	39 kWh/m²	10 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



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

Carbon dioxide emissions	1.4 tonnes	1.1 tonnes	0.3 tonnes
CO2 emissions per m ²	10 kg/m ²	8 kg/m ²	2 kg/m ²
Primary energy	56 kWh/m ²	45 kWh/m ²	11 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	53.1200 (1b)	x 2.4000 (2b)	= 127.4880 (1b) - (3b)
First floor	53.1200 (1c)	x 2.6900 (2c)	= 142.8928 (1c) - (3c)
Second floor	30.8200 (1d)	x 2.5000 (2d)	= 77.0500 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	137.0600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 347.4308 (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					0 * 10 = 0.0000 (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) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					4.3600
Infiltration rate					0.2180 (18)
Number of sides sheltered					0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.2180 (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	0.2780	0.2725	0.2671	0.2398	0.2344	0.2071	0.2071	0.2017	0.2180	0.2344	0.2453	0.2562 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
Effective ac	0.5280	0.5225	0.5171	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5062 (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			2.1200	1.3000	2.7560		(26)
Window (Uw = 1.40)			17.2200	1.3258	22.8295		(27)
French Door (Uw = 1.40)			4.5200	1.3258	5.9924		(27)
Roof Window (Uw = 1.80)			1.4600	1.6791	2.4515		(27a)
150mm EPS B&B			53.1200	0.1800	9.5616	75.0000	3984.0000 (28a)
140mm Timber Frame	172.8600	21.4100	151.4500	0.1900	28.7755	9.0000	1363.0500 (29a)
W2V	30.7800		30.7800	0.1400	4.3092	18.0000	554.0400 (29a)
Dormer Cheek	10.5100	2.4500	8.0600	0.3200	2.5792	18.0000	145.0800 (29a)
400mm Mineral Wool	14.3700		14.3700	0.1100	1.5807	9.0000	129.3300 (30)
Sloping	43.0100	1.4600	41.5500	0.2000	8.3100	9.0000	373.9500 (30)
Dormer Roof	4.3500		4.3500	0.2800	1.2180	9.0000	39.1500 (30)
C2V	22.3000		22.3000	0.1400	3.1220	9.0000	200.7000 (30)
Total net area of external elements Aum(A, m ²)			351.3000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	93.4857	(33)
Timber GF			74.7800			9.0000	673.0200 (32c)
Timber FF			135.1700			9.0000	1216.5300 (32c)
Timber 2F			38.0200			9.0000	342.1800 (32c)
Internal Floor			53.1200			18.0000	956.1600 (32d)
Internal Floor 2			30.8200			18.0000	554.7600 (32d)
Internal Ceiling			53.1200			18.0000	956.1600 (32e)
Internal Ceiling 2			30.8200			18.0000	554.7600 (32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12042.8700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		87.8657 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)		18.5664 (36)
Total fabric heat loss	(33) + (36) =	112.0520 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 60.5306	Feb 59.9058	Mar 59.2809	Apr 57.3261	May 57.3261	Jun 57.3261	Jul 57.3261	Aug 57.3261	Sep 57.3261	Oct 57.3261	Nov 57.3261	Dec 58.0312 (38)
Heat transfer coeff	172.5826	171.9578	171.3329	169.3781	169.3781	169.3781	169.3781	169.3781	169.3781	169.3781	169.3781	170.0832 (39)
Average = Sum(39)m / 12 =												170.0818 (39)

HLP	Jan 1.2592	Feb 1.2546	Mar 1.2501	Apr 1.2358	May 1.2358	Jun 1.2358	Jul 1.2358	Aug 1.2358	Sep 1.2358	Oct 1.2358	Nov 1.2358	Dec 1.2409 (40)
HLP (average)												1.2409 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9113 (42)
Average daily hot water use (litres/day)												103.3426 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	113.6769	109.5432	105.4095	101.2758	97.1421	93.0084	93.0084	97.1421	101.2758	105.4095	109.5432	113.6769 (44)
Energy content	168.5795	147.4407	152.1456	132.6442	127.2753	109.8289	101.7726	116.7856	118.1804	137.7278	150.3407	163.2603 (45)
Energy content (annual)												Total = Sum(45)m = 1625.9817 (45)
Distribution loss (46)m = 0.15 x (45)m	25.2869	22.1161	22.8218	19.8966	19.0913	16.4743	15.2659	17.5178	17.7271	20.6592	22.5511	24.4890 (46)
Water storage loss:												
Store volume												210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.4200 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7668 (55)
Total storage loss	23.7708	21.4704	23.7708	23.0040	23.7708	23.0040	23.7708	23.7708	23.0040	23.7708	23.0040	23.7708 (56)
If cylinder contains dedicated solar storage	15.2812	13.8024	15.2812	14.7883	15.2812	14.7883	15.2812	15.2812	14.7883	15.2812	14.7883	15.2812 (57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	207.1231	182.2543	189.2935	163.1909	153.0246	134.5225	127.2893	143.2328	150.0778	174.8757	187.6410	201.8039 (62)
Aperture area of solar collector												3.0000 (H1)
Zero-loss collector efficiency												0.7000 (H2)
Collector heat loss coefficient												1.8000 (H3)
Collector 2nd order heat loss coefficient												0.0050 (H3a)
Collector effective heat loss coefficient												1.8063 (H3b)
Collector performance ratio												2.5804 (H4)
Annual solar radiation per m2												1079.5246 (H5)
Overshading factor												0.8000 (H6)
Solar energy available												1813.6014 (H7)
Adjustment factor for showers												1.0000 (H7a)
Solar-to-load ratio												1.1154 (H8)
Utilisation factor												0.5920 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												115.5000 (H13)
Daily hot water demand												103.3426 (H14)
Volume ratio Veff/V												1.1176 (H15)
Solar storage volume factor												1.0000 (H16)
Solar input												-944.0945 (H17)
Solar input	-27.3769	-45.6841	-77.8053	-104.2744	-128.8222	-126.6528	-124.9790	-109.1948	-85.5214	-58.4011	-32.4729	-22.9098 (63)
Solar input (sum of months) = Sum(63)m =												-944.0945 (63)
Output from w/h	179.7463	136.5702	111.4882	58.9165	24.2024	7.8697	2.3103	34.0380	64.5564	116.4747	155.1681	178.8941 (64)
Total per year (kWh/year) = Sum(64)m =												1070.2349 (64)
Heat gains from water heating, kWh/month	86.8876	76.8749	80.3067	68.5416	62.9185	56.2730	54.2527	59.9890	64.8129	75.5128	79.8285	85.1189 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	174.6761	174.6761	174.6761	174.6761	174.6761	174.6761	174.6761	174.6761	174.6761	174.6761	174.6761	174.6761 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	70.2425	62.3887	50.7379	38.4119	28.7133	24.2410	26.1933	34.0470	45.6978	58.0238	67.7224	72.1947 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	456.7817	461.5217	449.5771	424.1486	392.0496	361.8811	341.7267	336.9867	348.9313	374.3598	406.4588	436.6273 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.3789	55.3789	55.3789	55.3789	55.3789	55.3789	55.3789	55.3789	55.3789	55.3789	55.3789	55.3789 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507 (71)
Water heating gains (Table 5)	116.7844	114.3972	107.9391	95.1966	84.5679	78.1569	72.9204	80.6303	90.0179	101.4957	110.8729	114.4072 (72)
Total internal gains	760.4128	754.9118	724.8584	674.3613	621.9350	580.8832	557.4445	568.2682	601.2512	650.4836	701.6583	739.8334 (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				8.2400	10.6334		0.7200		0.7000		0.7700		30.6029 (74)
East				4.2500	19.6403		0.7200		0.7000		0.7700		29.1541 (76)
South				4.1300	46.7521		0.7200		0.7000		0.7700		67.4395 (78)
West				0.6000	19.6403		0.7200		0.7000		0.7700		4.1159 (80)
South				4.5200	46.7521		0.7200		0.7000		0.7700		73.8079 (78)
West				1.4600	26.0000		0.6300		0.7000		1.0000		15.0663 (82)
Solar gains	220.1867	386.1855	556.8599	735.9081	864.9153	876.1918	837.4721	738.7741	618.5993	434.5970	265.7855		187.0915 (83)
Total gains	980.5995	1141.0973	1281.7183	1410.2693	1486.8503	1457.0750	1394.9166	1307.0423	1219.8505	1085.0806	967.4438		926.9249 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000 (85)
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FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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	19.3834	19.4539	19.5248	19.7501	19.7501	19.7501	19.7501	19.7501	19.7501	19.7501	19.7501	19.6683	
alpha	2.2922	2.2969	2.3017	2.3167	2.3167	2.3167	2.3167	2.3167	2.3167	2.3167	2.3167	2.3112	
util living area	0.9426	0.9189	0.8811	0.8154	0.7184	0.5904	0.4677	0.5076	0.6834	0.8437	0.9208	0.9487 (86)	
MIT	18.3550	18.6725	19.1634	19.7744	20.3091	20.6951	20.8735	20.8423	20.5435	19.8473	19.0060	18.3100 (87)	
Th 2	19.8730	19.8766	19.8802	19.8915	19.8915	19.8915	19.8915	19.8915	19.8915	19.8915	19.8915	19.8874 (88)	
util rest of house	0.9347	0.9078	0.8645	0.7883	0.6740	0.5192	0.3696	0.4099	0.6195	0.8148	0.9082	0.9416 (89)	
MIT 2	16.3690	16.8259	17.5290	18.3949	19.1225	19.6125	19.8077	19.7806	19.4419	18.5154	17.3214	16.3115 (90)	
Living area fraction	16.6098	17.0498	17.7272	18.5621	19.2664	19.7438	19.9369	19.9093	fLA = Living area / (4) =				0.1213 (91)
MIT									19.5755	18.6769	17.5257	16.5538 (92)	
Temperature adjustment												-0.1500	
adjusted MIT	16.4598	16.8998	17.5772	18.4121	19.1164	19.5938	19.7869	19.7593	19.4255	18.5269	17.3757	16.4038 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8986	0.8664	0.8189	0.7435	0.6378	0.4978	0.3595	0.3971	0.5881	0.7688	0.8671	0.9077 (94)
Useful gains	881.1550	988.6493	1049.6174	1048.5225	948.2787	725.3424	501.4647	519.0380	717.3813	834.2139	838.8791	841.3967 (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	2098.5725	2063.4581	1897.8808	1611.1487	1256.1810	845.8379	539.7949	568.9968	902.0229	1342.6412	1740.4702	2075.6671 (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	905.7587	722.2715	631.1080	405.0909	229.0793	0.0000	0.0000	0.0000	0.0000	378.2699	649.1456	918.2972 (98)
Space heating												4839.0210 (98)
Space heating per m2										(98) / (4) =		35.3059 (99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												90.6000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												5341.0828 (211)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	905.7587	722.2715	631.1080	405.0909	229.0793	0.0000	0.0000	0.0000	0.0000	378.2699	649.1456	918.2972 (98)
Space heating efficiency (main heating system 1)	90.6000	90.6000	90.6000	90.6000	90.6000	0.0000	0.0000	0.0000	0.0000	90.6000	90.6000	90.6000 (210)
Space heating fuel (main heating system)	999.7336	797.2092	696.5872	447.1202	252.8469	0.0000	0.0000	0.0000	0.0000	417.5165	716.4962	1013.5730 (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	179.7463	136.5702	111.4882	58.9165	24.2024	7.8697	2.3103	34.0380	64.5564	116.4747	155.1681	178.8941 (64)
Efficiency of water heater	88.6345	88.7109	88.8143	89.0852	89.4553	79.9000	79.9000	79.9000	79.9000	87.8309	88.3183	79.9000 (216)
Fuel for water heating, kWh/month	202.7949	153.9498	125.5295	66.1350	27.0553	9.8495	2.8915	42.6007	80.7965	132.6124	175.6919	201.7663 (219)
Water heating fuel used												1221.6733 (219)
Annual totals kWh/year												
Space heating fuel - main system												5341.0828 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
(MEVDecentralised, Database: total watage = 12.2330, total flow = 53.0000, SFP = 0.2308)												
mechanical ventilation fans (SFP = 0.2308)												97.8330 (230a)
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
pump for solar water heating												50.0000 (230g)
Total electricity for the above, kWh/year												222.8330 (231)
Electricity for lighting (calculated in Appendix L)												496.2015 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV Unit 0 (0.80 * 0.99 * 1068 * 1.00) =									-845.9118			-845.9118 (233)
Total delivered energy for all uses												6435.8787 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	5341.0828	3.4800	185.8697 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1221.6733	3.4800	42.5142 (247)
Mechanical ventilation fans	97.8330	13.1900	12.9042 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Pump for solar water heating	50.0000	13.1900	6.5950 (249)
Energy for lighting	496.2015	13.1900	65.4490 (250)
Additional standing charges			120.0000 (251)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Energy saving/generation technologies			
PV Unit	-845.9118	13.1900	-111.5758 (252)
Total energy cost			331.6488 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.7651 (257)
SAP value		89.3270
SAP rating (Section 12)		89 (258)
SAP band		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	5341.0828	0.2160	1153.6739 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1221.6733	0.2160	263.8814 (264)
Space and water heating			1417.5553 (265)
Pumps and fans	222.8330	0.5190	115.6503 (267)
Energy for lighting	496.2015	0.5190	257.5286 (268)
Energy saving/generation technologies			
PV Unit	-845.9118	0.5190	-439.0282 (269)
Total kg/year			1351.7060 (272)
CO2 emissions per m2			9.8600 (273)
EI value			90.0512
EI rating			90 (274)
EI band			B

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	53.1200 (1b)	x 2.4000 (2b)	= 127.4880 (1b) - (3b)
First floor	53.1200 (1c)	x 2.6900 (2c)	= 142.8928 (1c) - (3c)
Second floor	30.8200 (1d)	x 2.5000 (2d)	= 77.0500 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	137.0600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	347.4308 (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											0 * 10 =	0.0000 (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) =											Air changes per hour		
Pressure test											0.0000 / (5) =		0.0000 (8)
Measured/design AP50											Yes		4.3600
Infiltration rate													0.2180 (18)
Number of sides sheltered													0 (19)
Shelter factor											(20) = 1 - [0.075 x (19)] =		1.0000 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =		0.2180 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	4.4000	4.1000	4.1000	3.9000	3.9000	3.7000	3.7000	3.5000	3.5000	3.8000	3.7000	3.9000 (22)	
Adj infilt rate	1.1000	1.0250	1.0250	0.9750	0.9750	0.9250	0.9250	0.8750	0.8750	0.9500	0.9250	0.9750 (22a)	
	0.2398	0.2235	0.2235	0.2126	0.2126	0.2017	0.2017	0.1908	0.1908	0.2071	0.2017	0.2126 (22b)	
Mechanical extract ventilation - decentralised													
If mechanical ventilation:													0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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			2.1200	1.3000	2.7560		(26)					
Window (Uw = 1.40)			17.2200	1.3258	22.8295		(27)					
French Door (Uw = 1.40)			4.5200	1.3258	5.9924		(27)					
Roof Window (Uw = 1.80)			1.4600	1.6791	2.4515		(27a)					
150mm EPS B&B			53.1200	0.1800	9.5616	75.0000	3984.0000 (28a)					
140mm Timber Frame	172.8600	21.4100	151.4500	0.1900	28.7755	9.0000	1363.0500 (29a)					
W2V	30.7800		30.7800	0.1400	4.3092	18.0000	554.0400 (29a)					
Dormer Cheek	10.5100	2.4500	8.0600	0.3200	2.5792	18.0000	145.0800 (29a)					
400mm Mineral Wool	14.3700		14.3700	0.1100	1.5807	9.0000	129.3300 (30)					
Sloping	43.0100	1.4600	41.5500	0.2000	8.3100	9.0000	373.9500 (30)					
Dormer Roof	4.3500		4.3500	0.2800	1.2180	9.0000	39.1500 (30)					
C2V	22.3000		22.3000	0.1400	3.1220	9.0000	200.7000 (30)					
Total net area of external elements Aum(A, m2)			351.3000				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	93.4857		(33)					
Timber GF			74.7800			9.0000	673.0200 (32c)					
Timber FF			135.1700			9.0000	1216.5300 (32c)					
Timber 2F			38.0200			9.0000	342.1800 (32c)					
Internal Floor			53.1200			18.0000	956.1600 (32d)					
Internal Floor 2			30.8200			18.0000	554.7600 (32d)					
Internal Ceiling			53.1200			18.0000	956.1600 (32e)					
Internal Ceiling 2			30.8200			18.0000	554.7600 (32e)					
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			12042.8700 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							87.8657 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							18.5664 (36)					
Total fabric heat loss						(33) + (36) =	112.0520 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 57.3261	Feb 57.3261	Mar 57.3261	Apr 57.3261	May 57.3261	Jun 57.3261	Jul 57.3261	Aug 57.3261	Sep 57.3261	Oct 57.3261	Nov 57.3261	Dec 57.3261 (38)
Heat transfer coeff	169.3781	169.3781	169.3781	169.3781	169.3781	169.3781	169.3781	169.3781	169.3781	169.3781	169.3781	169.3781 (39)
Average = Sum(39)m / 12 =												169.3781 (39)
HLP	Jan 1.2358	Feb 1.2358	Mar 1.2358	Apr 1.2358	May 1.2358	Jun 1.2358	Jul 1.2358	Aug 1.2358	Sep 1.2358	Oct 1.2358	Nov 1.2358	Dec 1.2358 (40)
HLP (average)												1.2358 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9113 (42)
Average daily hot water use (litres/day)												103.3426 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	113.6769	109.5432	105.4095	101.2758	97.1421	93.0084	93.0084	97.1421	101.2758	105.4095	109.5432	113.6769 (44)
Energy content	168.5795	147.4407	152.1456	132.6442	127.2753	109.8289	101.7726	116.7856	118.1804	137.7278	150.3407	163.2603 (45)
Energy content (annual)												Total = Sum(45)m = 1625.9817 (45)
Distribution loss (46)m = 0.15 x (45)m	25.2869	22.1161	22.8218	19.8966	19.0913	16.4743	15.2659	17.5178	17.7271	20.6592	22.5511	24.4890 (46)
Water storage loss:												210.0000 (47)
Store volume												1.4200 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.7668 (55)
Enter (49) or (54) in (55)												0.7668 (55)
Total storage loss	23.7708	21.4704	23.7708	23.0040	23.7708	23.0040	23.7708	23.7708	23.0040	23.7708	23.0040	23.7708 (56)
If cylinder contains dedicated solar storage	15.2812	13.8024	15.2812	14.7883	15.2812	14.7883	15.2812	15.2812	14.7883	15.2812	14.7883	15.2812 (57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	207.1231	182.2543	189.2935	163.1909	153.0246	134.5225	127.2893	143.2328	150.0778	174.8757	187.6410	201.8039 (62)
Aperture area of solar collector												3.0000 (H1)
Zero-loss collector efficiency												0.7000 (H2)
Collector heat loss coefficient												1.8000 (H3)
Collector 2nd order heat loss coefficient												0.0050 (H3a)
Collector effective heat loss coefficient												1.8063 (H3b)
Collector performance ratio												2.5804 (H4)
Annual solar radiation per m2												1200.5924 (H5)
Overshading factor												0.8000 (H6)
Solar energy available												2016.9953 (H7)
Adjustment factor for showers												1.0000 (H7a)
Solar-to-load ratio												1.2405 (H8)
Utilisation factor												0.5534 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												115.5000 (H13)
Daily hot water demand												103.3426 (H14)
Volume ratio Veff/V												1.1176 (H15)
Solar storage volume factor												1.0000 (H16)
Solar input												-981.5104 (H17)
Solar input	-32.2208	-45.8160	-78.7466	-106.2474	-124.1762	-133.8844	-127.4474	-116.1600	-90.7676	-62.4216	-38.1087	-25.5136 (63)
Solar input (sum of months) = Sum(63)m =												-981.5104 (63)
Output from w/h	174.9023	136.4384	110.5469	56.9435	28.8484	0.6381	0.0000	27.0728	59.3102	112.4541	149.5322	176.2903 (64)
Total per year (kWh/year) = Sum(64)m =												1032.9771 (64)
Heat gains from water heating, kWh/month	86.8876	76.8749	80.3067	68.5416	62.9185	56.2730	54.2527	59.9890	64.8129	75.5128	79.8285	85.1189 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	174.6761	174.6761	174.6761	174.6761	174.6761	174.6761	174.6761	174.6761	174.6761	174.6761	174.6761	174.6761 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	70.2425	62.3887	50.7379	38.4119	28.7133	24.2410	26.1933	34.0470	45.6978	58.0238	67.7224	72.1947 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	456.7817	461.5217	449.5771	424.1486	392.0496	361.8811	341.7267	336.9867	348.9313	374.3598	406.4588	436.6273 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.3789	55.3789	55.3789	55.3789	55.3789	55.3789	55.3789	55.3789	55.3789	55.3789	55.3789	55.3789 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507	-116.4507 (71)
Water heating gains (Table 5)	116.7844	114.3972	107.9391	95.1966	84.5679	78.1569	72.9204	80.6303	90.0179	101.4957	110.8729	114.4072 (72)
Total internal gains	760.4128	754.9118	724.8584	674.3613	621.9350	580.8832	557.4445	568.2682	601.2512	650.4836	701.6583	739.8334 (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				8.2400	13.4839		0.7200		0.7000		0.7700		38.8067 (74)
East				4.2500	25.1925		0.7200		0.7000		0.7700		37.3960 (76)
South				4.1300	56.7559		0.7200		0.7000		0.7700		81.8700 (78)
West				0.6000	25.1925		0.7200		0.7000		0.7700		5.2794 (80)
South				4.5200	56.7559		0.7200		0.7000		0.7700		89.6010 (78)
West				1.4600	34.0000		0.6300		0.7000		1.0000		19.7021 (82)
Solar gains	272.6551	407.8043	595.5299	797.0064	890.0797	990.4187	912.6056	837.0380	695.3051	489.5894	328.2007	219.2227	(83)
Total gains	1033.0679	1162.7161	1320.3883	1471.3676	1512.0148	1571.3019	1470.0501	1405.3063	1296.5563	1140.0730	1029.8590	959.0561	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000 (85)
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FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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	19.7501	19.7501	19.7501	19.7501	19.7501	19.7501	19.7501	19.7501	19.7501	19.7501	19.7501	19.7501
alpha	2.3167	2.3167	2.3167	2.3167	2.3167	2.3167	2.3167	2.3167	2.3167	2.3167	2.3167	2.3167
util living area	0.9276	0.9052	0.8571	0.7759	0.6548	0.4780	0.3541	0.3680	0.5907	0.7920	0.8950	0.9362 (86)
MIT	18.7057	18.9494	19.4495	20.0169	20.5258	20.8464	20.9476	20.9431	20.7281	20.1533	19.3481	18.6463 (87)
Th 2	19.8915	19.8915	19.8915	19.8915	19.8915	19.8915	19.8915	19.8915	19.8915	19.8915	19.8915	19.8915 (88)
util rest of house	0.9173	0.8920	0.8365	0.7424	0.5988	0.3933	0.2446	0.2551	0.5098	0.7519	0.8774	0.9268 (89)
MIT 2	16.8846	17.2320	17.9412	18.7281	19.4026	19.7755	19.8684	19.8662	19.6587	18.9347	17.8106	16.8010 (90)
Living area fraction									fLA = Living area / (4) =			0.1213 (91)
MIT	17.1054	17.4403	18.1241	18.8843	19.5388	19.9053	19.9993	19.9968	19.7884	19.0825	17.9970	17.0248 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.9554	17.2903	17.9741	18.7343	19.3888	19.7553	19.8493	19.8468	19.6384	18.9325	17.8470	16.8748 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8779	0.8489	0.7906	0.7004	0.5699	0.3820	0.2402	0.2503	0.4890	0.7087	0.8328	0.8893 (94)
Useful gains	906.9145	987.0177	1043.9590	1030.5368	861.6852	600.2270	353.1376	351.7270	634.0729	808.0025	857.7043	852.8608 (95)
Ext temp.	5.4000	5.9000	7.6000	10.0000	13.1000	15.9000	17.7000	17.7000	15.3000	12.0000	8.4000	5.5000 (96)
Heat loss rate W	1957.2300	1929.2635	1757.1427	1479.4059	1065.1853	653.0063	364.0396	363.6224	734.8266	1174.2096	1600.1198	1926.6420 (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	781.4347	633.1892	530.6087	323.1857	151.4041	0.0000	0.0000	0.0000	0.0000	272.4581	534.5392	798.8932 (98)
Space heating												4025.7129 (98)
Space heating per m2										(98) / (4) =		29.3719 (99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												90.6000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												4443.3918 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	781.4347	633.1892	530.6087	323.1857	151.4041	0.0000	0.0000	0.0000	0.0000	272.4581	534.5392	798.8932 (98)
Space heating efficiency (main heating system 1)	90.6000	90.6000	90.6000	90.6000	90.6000	0.0000	0.0000	0.0000	0.0000	90.6000	90.6000	90.6000 (210)
Space heating fuel (main heating system)	862.5107	698.8843	585.6608	356.7171	167.1127	0.0000	0.0000	0.0000	0.0000	300.7264	589.9991	881.7806 (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	174.9023	136.4384	110.5469	56.9435	28.8484	0.6381	0.0000	27.0728	59.3102	112.4541	149.5322	176.2903 (64)
Efficiency of water heater	88.4341	88.4990	88.5553	88.8182	88.6989	79.9000	79.9000	79.9000	79.9000	87.1888	88.0233	79.9000 (216)
(217)m												88.4585 (217)
Fuel for water heating, kWh/month	197.7770	154.1694	124.8337	64.1124	32.5239	0.7986	0.0000	33.8833	74.2305	128.9777	169.8781	199.2915 (219)
Water heating fuel used												1180.4763 (219)
Annual totals kWh/year												
Space heating fuel - main system												4443.3918 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
(MEV)Decentralised, Database: total watage = 12.2330, total flow = 53.0000, SFP = 0.2308)												
mechanical ventilation fans (SFP = 0.2308)												97.8330 (230a)
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
pump for solar water heating												50.0000 (230g)
Total electricity for the above, kWh/year												222.8330 (231)
Electricity for lighting (calculated in Appendix L)												496.2015 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV Unit 0 (0.80 * 0.99 * 1179 * 1.00) =										-933.8290		-933.8290 (233)
Total delivered energy for all uses												5409.0736 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	4443.3918	10.2300	454.5590 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1180.4763	10.2300	120.7627 (247)
Mechanical ventilation fans	97.8330	36.7200	35.9243 (249)
Pumps and fans for heating	75.0000	36.7200	27.5400 (249)
Pump for solar water heating	50.0000	36.7200	18.3600 (249)
Energy for lighting	496.2015	36.7200	182.2052 (250)
Additional standing charges			103.0000 (251)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Energy saving/generation technologies			
PV Unit	-933.8290	36.7200	-342.9020 (252)
Total energy cost			599.4492 (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	4443.3918	0.2160	959.7726 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1180.4763	0.2160	254.9829 (264)
Space and water heating			1214.7555 (265)
Pumps and fans	222.8330	0.5190	115.6503 (267)
Energy for lighting	496.2015	0.5190	257.5286 (268)
Energy saving/generation technologies			
PV Unit	-933.8290	0.5190	-484.6572 (269)
Total kg/year			1103.2772 (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	4443.3918	1.2200	5420.9380 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1180.4763	1.2200	1440.1811 (264)
Space and water heating			6861.1191 (265)
Pumps and fans	222.8330	3.0700	684.0972 (267)
Energy for lighting	496.2015	3.0700	1523.3385 (268)
Energy saving/generation technologies			
PV Unit	-933.8290	3.0700	-2866.8549 (269)
Primary energy kWh/year			6201.7000 (272)
Primary energy kWh/m2/year			45.2481 (273)

SAP 2012 OVERHEATING ASSESSMENT FOR New Build (As Built) 9.92

Overheating Calculation Input Data

Dwelling type	Detached House
Number of storeys	3
Cross ventilation possible	Yes
SAP Region	Southern England
Front of dwelling faces	North
Overshading	Average or unknown
Thermal mass parameter	87.9 (calculated from construction elements)
Night ventilation	No
Ventilation rate during hot weather (ach)	4.00 (Windows half open)

Overheating Calculation

Summer ventilation heat loss coefficient	458.61 (P1)
Transmission heat loss coefficient	112.05 (37)
Summer heat loss coefficient	570.66 (P2)

Overhangs	Ratio	Z_overhangs	Overhang type
Orientation			
North	0.000	1.000	None
East	0.000	1.000	None
South	0.000	1.000	None
West	0.000	1.000	None

Solar shading	Z blinds	Solar access	Z overhangs	Z summer
Orientation				
North	1.000	0.90	1.000	0.900 (P8)
East	1.000	0.90	1.000	0.900 (P8)
South	1.000	0.90	1.000	0.900 (P8)
West	1.000	0.90	1.000	0.900 (P8)
West	1.000	1.00	1.000	1.000 (P8)

[Jul]	Area m2	Solar flux Table 6a W/m2	Specific data g or Table 6b	FF Specific data or Table 6c	Shading	Gains W
North	8.2400	87.1704	0.7200	0.7000	0.9000	293.2324
East	4.2500	125.2818	0.7200	0.7000	0.9000	217.3664
South	4.1300	118.5567	0.7200	0.7000	0.9000	199.8902
West	0.6000	125.2818	0.7200	0.7000	0.9000	30.6870
South	4.5200	118.5567	0.7200	0.7000	0.9000	218.7661
West	1.4600	217.0000	0.6300	0.7000	1.0000	125.7459

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



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

total:				1085.6880
	Jun	Jul	Aug	
Solar gains	1164	1086	976	(P3)
Internal gains	601	578	587	
Total summer gains	1765	1663	1563	(P5)
Summer gain/loss ratio	3.09	2.91	2.74	(P6)
Summer external temperature	15.40	17.30	17.30	
Thermal mass temperature increment (TMP = 87.9)	1.38	1.38	1.38	
Threshold temperature	19.88	21.60	21.42	(P7)
Likelihood of high internal temperature	Not significant	Slight	Slight	
Assessment of likelihood of high internal temperature:	Slight			