

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



Property Reference	4907-T511-3796-232			Issued on Date	27/11/2023
Assessment Reference	As Built	Prop Type Ref	RPv3 Det Op		
Property	61, Pembers Farm Avenue, Fair Oak, EASTLEIGH, SO50 7QL				
SAP Rating	88 B	DER	13.20	TER	17.00
Environmental	88 B	% DER<TER	22.36		
CO ₂ Emissions (t/year)	1.42	DFEE	52.02	TFEE	60.55
General Requirements Compliance	Pass	% DFEE<TFEE	14.09		
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) 17.00 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 13.20 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 60.5 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE) 52.0 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: 4.93 (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 East: 4.25 m², No overhang

Windows facing South East: 9.65 m², No overhang

Windows facing South West: 0.60 m², No overhang

Windows facing North West: 8.24 m², No overhang

Air change rate: 4.00 ach

Blinds/curtains: None

10 Key features

External wall U-value 0.14 W/m²K

Party wall U-value 0.00 W/m²K

Roof U-value 0.11 W/m²K

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	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					4.9300
Infiltration rate					0.2465 (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) =				0.2465 (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	0.3143	0.3081	0.3020	0.2712	0.2650	0.2342	0.2342	0.2280	0.2465	0.2650	0.2773	0.2896 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
Effective ac	0.5643	0.5581	0.5520	0.5212	0.5150	0.5000	0.5000	0.5000	0.5000	0.5150	0.5273	0.5396 (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)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	64.6968	63.9902	63.2837	59.7510	59.0444	57.3261	57.3261	57.3261	57.3261	59.0444	60.4575	61.8706 (38)
Heat transfer coeff	176.7488	176.0423	175.3357	171.8030	171.0964	169.3781	169.3781	169.3781	169.3781	171.0964	172.5095	173.9226 (39)
Average = Sum(39)m / 12 =												172.1723 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2896	1.2844	1.2793	1.2535	1.2483	1.2358	1.2358	1.2358	1.2358	1.2483	1.2586	1.2690 (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			
Northeast				4.2500	11.2829	0.7200	0.7000	0.7700	16.7485 (75)			
Southeast				4.1300	36.7938	0.7200	0.7000	0.7700	53.0749 (77)			
Southwest				0.6000	36.7938	0.7200	0.7000	0.7700	7.7106 (79)			
Northwest				8.2400	11.2829	0.7200	0.7000	0.7700	32.4723 (81)			
Southeast				4.5200	36.7938	0.7200	0.7000	0.7700	58.0868 (77)			
Southwest				1.4600	26.0000	0.6300	0.7000	1.0000	15.0663 (82)			
Solar gains	183.1594	333.9654	513.1873	726.6465	894.2432	922.4410	874.9554	745.0669	586.5781	384.4732	223.4367	154.0950 (83)
Total gains	712.8821	861.3352	1022.9367	1207.6890	1345.5246	1345.5597	1280.1150	1156.9016	1013.4598	840.2979	712.5236	668.7180 (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	18.9265	19.0025	19.0791	19.4714	19.5518	19.7501	19.7501	19.7501	19.7501	19.5518	19.3916	19.2341
alpha	2.2618	2.2668	2.2719	2.2981	2.3035	2.3167	2.3167	2.3167	2.3167	2.3035	2.2928	2.2823
util living area	0.9692	0.9522	0.9204	0.8556	0.7533	0.6202	0.4989	0.5530	0.7465	0.8977	0.9557	0.9731 (86)
MIT	17.9787	18.3034	18.8527	19.5847	20.2166	20.6600	20.8547	20.8101	20.4385	19.6097	18.6800	17.9424 (87)
Th 2	19.8490	19.8531	19.8571	19.8774	19.8815	19.8915	19.8915	19.8915	19.8915	19.8815	19.8734	19.8652 (88)
util rest of house	0.9646	0.9451	0.9081	0.8323	0.7110	0.5489	0.3972	0.4520	0.6870	0.8762	0.9479	0.9691 (89)
MIT 2	15.8175	16.2889	17.0821	18.1313	19.0012	19.5767	19.7937	19.7548	19.3234	18.1897	16.8495	15.7718 (90)
Living area fraction	16.0796	16.5332	17.2968	18.3075	19.1486	19.7081	19.9224	19.8828	19.4586	18.3619	17.0715	16.0350 (92)
Temperature adjustment	15.9296	16.3832	17.1468	18.1575	18.9986	19.5581	19.7724	19.7328	19.3086	18.2119	16.9215	-0.1500
adjusted MIT	15.9296	16.3832	17.1468	18.1575	18.9986	19.5581	19.7724	19.7328	19.3086	18.2119	16.9215	15.8850 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9385	0.9116	0.8660	0.7858	0.6709	0.5246	0.3852	0.4357	0.6488	0.8309	0.9156	0.9455 (94)
Useful gains	669.0481	785.1698	885.8971	948.9553	902.6743	705.8337	493.1167	504.0782	657.5077	698.2323	652.3897	632.2728 (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	2055.5181	2021.5292	1866.7665	1590.4678	1248.7561	839.7902	537.3311	564.5039	882.2284	1302.3605	1694.2960	2032.2928 (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	1031.5337	830.8335	729.7668	461.8890	257.4849	0.0000	0.0000	0.0000	0.0000	449.4714	750.1725	1041.6148 (98)
Space heating												5552.7667 (98)
Space heating per m2												40.5134 (99)
										(98) / (4) =		

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	6128.8815	(211)

[illegible][illegible]

Electricity for pumps and fans:

(MEVDecentralised, Database: total watage = 12.2330, total flow = 53.0000, SFP = 0.2308)

mechanical ventilation fans (SFP = 0.2308)

central heating pump

main heating flue fan

Total electricity for the above, kWh/year

Electricity for lighting (calculated in Appendix L)

Energy saving/generation technologies (Appendices M ,N and Q)

PV Unit 0 (0.80 * 0.99 * 1004 * 1.00) =

Total delivered energy for all uses

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	6128.8815	0.2160	1323.8384 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2553.2308	0.2160	551.4978 (264)
Space and water heating			1875.3363 (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	-795.1650	0.5190	-412.6906 (269)
Total CO2, kg/year			1809.8745 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			13.2000 (273)

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

NET CO ₂ EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES			
DER			13.2000 ZC1
Total Floor Area		TFA	137.0600
Assumed number of occupants		N	2.9113
CO ₂ emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO ₂ emissions from appliances, equation (L14)			13.2318 ZC2
CO ₂ emissions from cooking, equation (L16)			1.3780 ZC3
Total CO ₂ emissions			27.8098 ZC4
Residual CO ₂ emissions offset from biofuel CHP			0.0000 ZC5
Additional allowable electricity generation, kWh/m ² /year			0.0000 ZC6
Resulting CO ₂ emissions offset from additional allowable electricity generation			0.0000 ZC7
Net CO ₂ emissions			27.8098 ZC8

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	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)
Heat transfer coeff	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)
Average = Sum(39)m / 12 =												166.5321 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	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)
HLP (average)												1.2150 (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)

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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
Northeast				4.2500	11.2829		0.6300		0.7000		0.7700		14.6549 (75)
Southeast				8.6500	36.7938		0.6300		0.7000		0.7700		97.2664 (77)
Southwest				0.6000	36.7938		0.6300		0.7000		0.7700		6.7468 (79)
Northwest				8.2400	11.2829		0.6300		0.7000		0.7700		28.4133 (81)
Southwest				1.4600	26.0000		0.6300		0.7000		1.0000		15.0663 (82)
Solar gains	162.1477	296.1312	455.9926	646.6808	796.3702	821.6227	779.2761	663.3057	521.5858	341.1947	197.8974	136.3543	(83)
Total gains	696.9386	828.5691	970.8101	1132.7914	1252.7197	1249.8095	1189.5038	1080.2086	953.5357	802.0875	692.0525	656.0454	(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	0.9990	0.9976	0.9926	0.9716	0.9023	0.7506	0.5850	0.6561	0.8933	0.9866	0.9979	0.9993 (86)
MIT	19.5582	19.7192	19.9984	20.3807	20.7191	20.9234	20.9820	20.9695	20.8057	20.3656	19.8967	19.5370 (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	0.9987	0.9967	0.9897	0.9598	0.8614	0.6571	0.4528	0.5224	0.8315	0.9792	0.9970	0.9990 (89)
MIT 2	17.9638	18.2010	18.6098	19.1682	19.6277	19.8694	19.9150	19.9108	19.7518	19.1550	18.4701	17.9402 (90)
Living area fraction	18.1571	18.3851	18.7781	19.3152	19.7601	19.9972	20.0444	20.0392	19.8796	19.3018	18.6431	18.1338 (91)
MIT	18.1571	18.3851	18.7781	19.3152	19.7601	19.9972	20.0444	20.0392	19.8796	19.3018	18.6431	18.1338 (92)
Temperature adjustment												0.0000
adjusted MIT	18.1571	18.3851	18.7781	19.3152	19.7601	19.9972	20.0444	20.0392	19.8796	19.3018	18.6431	18.1338 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9978	0.9948	0.9854	0.9512	0.8545	0.6643	0.4686	0.5378	0.8288	0.9731	0.9953	0.9983 (94)
Useful gains	695.3973	824.2650	956.6566	1077.5164	1070.4723	830.3093	557.4423	580.9786	790.3342	780.5046	688.7954	654.9610 (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	2351.6990	2282.0523	2072.0003	1734.4835	1338.9287	886.1404	565.5124	596.1946	953.2231	1445.5264	1927.2217	2338.6227 (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	1232.2885	979.6331	829.8156	473.0163	199.7315	0.0000	0.0000	0.0000	0.0000	494.7762	891.6670	1252.6443 (98)

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Space heating 6353.5725 (98)
 Space heating per m2 (98) / (4) = 46.3561 (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													6795.2647 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1232.2885	979.6331	829.8156	473.0163	199.7315	0.0000	0.0000	0.0000	0.0000	494.7762	891.6670	1252.6443	(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)	1317.9556	1047.7359	887.5034	505.8998	213.6166	0.0000	0.0000	0.0000	0.0000	529.1724	953.6545	1339.7265	(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	88.6961	88.5362	88.1682	87.2404	85.1062	79.8000	79.8000	79.8000	79.8000	87.2601	88.3265	88.7565	(216)
Fuel for water heating, kWh/month	248.4055	219.3223	231.2537	209.4460	210.3511	200.3838	192.3800	211.1932	210.8493	217.1375	226.9058	242.2434	(219)
Water heating fuel used												2619.8716	(219)
Annual totals kWh/year													
Space heating fuel - main system												6795.2647	(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												9986.3377	(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	6795.2647	0.2160	1467.7772 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2619.8716	0.2160	565.8923 (264)
Space and water heating			2033.6694 (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			2330.1230 (272)
Emissions per m2 for space and water heating			14.8378 (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) = (14.8378 * 1.00) + 1.8789 + 0.2840, rounded to 2 d.p.			17.0000 (273)

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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 (m2)	Storey height (m)	Volume (m3)
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 * 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					4.9300
Infiltration rate					0.3616 (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) =				0.3616 (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	0.4611	0.4520	0.4430	0.3978	0.3888	0.3435	0.3435	0.3345	0.3616	0.3888	0.4068	0.4249 (22b)
Effective ac	0.6063	0.6022	0.5981	0.5791	0.5756	0.5590	0.5590	0.5559	0.5654	0.5756	0.5828	0.5903 (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 69.5133	Feb 69.0400	Mar 68.5762	Apr 66.3974	May 65.9897	Jun 64.0921	Jul 64.0921	Aug 63.7406	Sep 64.8230	Oct 65.9897	Nov 66.8144	Dec 67.6765	(38)
Heat transfer coeff	181.5653	181.0920	180.6282	178.4494	178.0417	176.1441	176.1441	175.7927	176.8750	178.0417	178.8664	179.7285	(39)
Average = Sum(39)m / 12 =												178.4474	(39)
HLP	Jan 1.3247	Feb 1.3213	Mar 1.3179	Apr 1.3020	May 1.2990	Jun 1.2852	Jul 1.2852	Aug 1.2826	Sep 1.2905	Oct 1.2990	Nov 1.3050	Dec 1.3113	(40)
HLP (average)												1.3020	(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
Northeast					4.2500	11.2829	0.7200	0.7000	0.7700					16.7485	(75)
Southeast					4.1300	36.7938	0.7200	0.7000	0.7700					53.0749	(77)
Southwest					0.6000	36.7938	0.7200	0.7000	0.7700					7.7106	(79)
Northwest					8.2400	11.2829	0.7200	0.7000	0.7700					32.4723	(81)
Southeast					4.5200	36.7938	0.7200	0.7000	0.7700					58.0868	(77)
Southwest					1.4600	26.0000	0.6300	0.7000	1.0000					15.0663	(82)
Solar gains	183.1594	333.9654	513.1873	726.6465	894.2432	922.4410	874.9554	745.0669	586.5781	384.4732	223.4367	154.0950	(83)		
Total gains	632.1185	781.4332	944.8237	1132.0083	1271.4230	1273.6815	1210.1267	1084.4919	940.1898	764.5104	633.8934	588.8123	(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	17.2687	17.3138	17.3583	17.5702	17.6104	17.8002	17.8002	17.8357	17.7266	17.6104	17.5292	17.4452
alpha	2.1512	2.1543	2.1572	2.1713	2.1740	2.1867	2.1867	2.1890	2.1818	2.1740	2.1686	2.1630
util living area	0.9727	0.9564	0.9262	0.8656	0.7697	0.6434	0.5258	0.5815	0.7696	0.9087	0.9610	0.9764 (86)
MIT	17.6985	18.0349	18.6121	19.3758	20.0664	20.5735	20.8078	20.7531	20.3128	19.4050	18.4179	17.6450 (87)
Th 2	19.8215	19.8242	19.8269	19.8393	19.8416	19.8525	19.8525	19.8545	19.8483	19.8416	19.8369	19.8320 (88)
util rest of house	0.9686	0.9499	0.9148	0.8435	0.7286	0.5718	0.4199	0.4778	0.7121	0.8891	0.9542	0.9729 (89)
MIT 2	16.8087	17.1434	17.7143	18.4659	19.1202	19.5796	19.7627	19.7309	19.3681	18.5103	17.5350	16.7622 (90)
Living area fraction	fLA = Living area / (4) =											0.1213 (91)
MIT	16.9166	17.2515	17.8232	18.5763	19.2350	19.7001	19.8894	19.8548	19.4826	18.6188	17.6420	16.8693 (92)
Temperature adjustment												0.0000
adjusted MIT	16.9166	17.2515	17.8232	18.5763	19.2350	19.7001	19.8894	19.8548	19.4826	18.6188	17.6420	16.8693 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9538	0.9299	0.8886	0.8134	0.7031	0.5610	0.4237	0.4778	0.6900	0.8614	0.9355	0.9597 (94)
Useful gains	602.9294	726.6858	839.5521	920.7720	893.9690	714.5385	512.6917	518.2024	648.7300	658.5758	593.0315	565.0675 (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	2290.7363	2236.7621	2045.2826	1726.7251	1341.5397	898.3516	579.4140	607.3372	952.0556	1427.6801	1885.6156	2277.0292 (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	1255.7283	1014.7713	897.0635	580.2863	332.9926	0.0000	0.0000	0.0000	0.0000	572.2136	930.6606	1273.6995 (98)
Space heating												6857.4157 (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) = 50.0322 (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	1655.7543	1303.4661	1336.0241	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6723	0.7360	0.6959	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1113.2427	959.3612	929.6940	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1590.7522	1514.7770	1373.4916	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	343.8068	413.2294	330.1854	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling													
Cooled fraction													1087.2216 (104)
Intermittency factor (Table 10b)									fC = cooled area / (4) =			1.0000	(105)
	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	85.9517	103.3073	82.5464	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling													271.8054 (107)
Space cooling per m2													1.9831 (108)
Energy for space heating													50.0322 (99)
Energy for space cooling													1.9831 (108)
Total													52.0153 (109)
Dwelling Fabric Energy Efficiency (DFEE)													52.0 (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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	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)
Heat transfer coeff	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)
Average = Sum(39)m / 12 =												166.5321 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	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)
HLP (average)												1.2150 (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				
Northeast				4.2500	11.2829	0.6300	0.7000	0.7700	14.6549 (75)				
Southeast				8.6500	36.7938	0.6300	0.7000	0.7700	97.2664 (77)				
Southwest				0.6000	36.7938	0.6300	0.7000	0.7700	6.7468 (79)				
Northwest				8.2400	11.2829	0.6300	0.7000	0.7700	28.4133 (81)				
Southwest				1.4600	26.0000	0.6300	0.7000	1.0000	15.0663 (82)				
Solar gains	162.1477	296.1312	455.9926	646.6808	796.3702	821.6227	779.2761	663.3057	521.5858	341.1947	197.8974	136.3543	(83)
Total gains	611.1069	743.5989	887.6290	1052.0426	1173.5499	1172.8632	1114.4474	1002.7307	875.1975	721.2319	608.3542	571.0716	(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	0.9995	0.9985	0.9949	0.9785	0.9200	0.7809	0.6182	0.6945	0.9176	0.9913	0.9988	0.9996	(86)
MIT	19.5006	19.6625	19.9440	20.3326	20.6847	20.9084	20.9773	20.9611	20.7727	20.3138	19.8405	19.4797	(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	0.9993	0.9979	0.9929	0.9693	0.8840	0.6898	0.4815	0.5585	0.8647	0.9863	0.9983	0.9995	(89)
MIT 2	18.5171	18.6810	18.9638	19.3571	19.6892	19.8777	19.9157	19.9120	19.7798	19.3445	18.8695	18.5048	(90)
Living area fraction	fLA = Living area / (4) =												0.1213 (91)
MIT	18.6364	18.8000	19.0827	19.4754	19.8099	20.0027	20.0445	20.0392	19.9002	19.4620	18.9873	18.6230	(92)
Temperature adjustment													0.0000
adjusted MIT	18.6364	18.8000	19.0827	19.4754	19.8099	20.0027	20.0445	20.0392	19.9002	19.4620	18.9873	18.6230	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	610.4505	741.4541	879.4466	1014.6398	1032.6543	818.0893	555.0567	576.0651	755.8624	709.2351	606.9075	570.6338	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	2433.0372	2352.2743	2123.3929	1761.1644	1347.2070	887.0368	565.5257	596.2002	956.6230	1472.1438	1984.6874	2420.7351	(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	1356.0045	1082.4712	925.4961	537.4977	234.0272	0.0000	0.0000	0.0000	0.0000	567.6041	992.0015	1376.4754	(98)
Space heating													7071.5776 (98)
Space heating per m2													(98) / (4) = 51.5948 (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

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	0.8096	0.8832	0.8404	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1249.4142	1073.0856	1046.3066	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1472.9127	1402.9440	1277.9266	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	160.9189	245.4146	172.3252	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												578.6588	(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	40.2297	61.3537	43.0813	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling												144.6647	(107)
Space cooling per m2												1.0555	(108)
Energy for space heating												51.5948	(99)
Energy for space cooling												1.0555	(108)
Total												52.6502	(109)
Target Fabric Energy Efficiency (TFEE)												60.5	(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							4.9300					
Infiltration rate							0.2465	(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) =	0.2465 (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)
	0.2712	0.2527	0.2527	0.2403	0.2403	0.2280	0.2280	0.2157	0.2157	0.2342	0.2280	0.2403 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5212	0.5027	0.5027	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	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	59.7510	57.6313	57.6313	57.3261	57.3261	57.3261	57.3261	57.3261	57.3261	57.3261	57.3261	57.3261 (38)
Heat transfer coeff	171.8030	169.6834	169.6834	169.3781	169.3781	169.3781	169.3781	169.3781	169.3781	169.3781	169.3781	169.3781 (39)
Average = Sum(39)m / 12 =												169.6310 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2535	1.2380	1.2380	1.2358	1.2358	1.2358	1.2358	1.2358	1.2358	1.2358	1.2358	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:												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)
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				
Northeast			4.2500	14.6176	0.7200	0.7000	0.7700	21.6985 (75)				
Southeast			4.1300	45.1778	0.7200	0.7000	0.7700	65.1687 (77)				
Southwest			0.6000	45.1778	0.7200	0.7000	0.7700	9.4676 (79)				
Northwest			8.2400	14.6176	0.7200	0.7000	0.7700	42.0696 (81)				
Southeast			4.5200	45.1778	0.7200	0.7000	0.7700	71.3227 (77)				
Southwest			1.4600	34.0000	0.6300	0.7000	1.0000	19.7021 (82)				
Solar gains	229.4292	357.5204	557.2212	797.8674	930.3050	1052.3678	962.9919	854.8910	669.2696	439.4585	279.2912	182.5203 (83)
Total gains	998.9706	1121.5608	1292.7090	1488.8613	1575.1259	1656.3871	1543.5724	1445.2947	1285.6525	1100.5714	990.0781	931.4823 (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	19.4714	19.7146	19.7146	19.7501	19.7501	19.7501	19.7501	19.7501	19.7501	19.7501	19.7501	19.7501
alpha	2.2981	2.3143	2.3143	2.3167	2.3167	2.3167	2.3167	2.3167	2.3167	2.3167	2.3167	2.3167
util living area	0.9325	0.9112	0.8620	0.7723	0.6398	0.4591	0.3394	0.3593	0.5939	0.8021	0.9019	0.9396 (86)
MIT	18.6328	18.9031	19.4216	20.0281	20.5500	20.8591	20.9522	20.9460	20.7249	20.1258	19.3088	18.6155 (87)
Th 2	19.8774	19.8897	19.8897	19.8915	19.8915	19.8915	19.8915	19.8915	19.8915	19.8915	19.8915	19.8915 (88)
util rest of house	0.9226	0.8985	0.8419	0.7385	0.5834	0.3762	0.2337	0.2485	0.5130	0.7630	0.8852	0.9306 (89)
MIT 2	16.7736	17.1660	17.9019	18.7425	19.4298	19.7859	19.8706	19.8676	19.6556	18.8999	17.7563	16.7571 (90)
Living area fraction												fLA = Living area / (4) = 0.1213 (91)
MIT	16.9990	17.3766	18.0861	18.8984	19.5656	19.9161	20.0017	19.9984	19.7853	19.0486	17.9446	16.9825 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.8490	17.2266	17.9361	18.7484	19.4156	19.7661	19.8517	19.8484	19.6353	18.8986	17.7946	16.8325 (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	0.8838	0.8561	0.7960	0.6968	0.5561	0.3661	0.2297	0.2440	0.4919	0.7191	0.8412	0.8940	(94)
Useful gains	882.9345	960.2056	1028.9996	1037.4789	875.9855	606.4731	354.5464	352.6185	632.3657	791.4349	832.8913	832.7002	(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	1966.9798	1921.9376	1753.8706	1481.7822	1069.7267	654.8247	364.4553	363.8862	734.3007	1168.4712	1591.2340	1919.4724	(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	806.5297	646.2839	539.3041	319.8984	144.1435	0.0000	0.0000	0.0000	0.0000	280.5150	546.0067	808.5585	(98)
Space heating												4091.2397	(98)
RHI space heating demand												4091	(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							4.9300					
Infiltration rate							0.2465	(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) =	0.2465 (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												
	0.3143	0.3081	0.3020	0.2712	0.2650	0.2342	0.2342	0.2280	0.2465	0.2650	0.2773	0.2896 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5643	0.5581	0.5520	0.5212	0.5150	0.5000	0.5000	0.5000	0.5000	0.5150	0.5273	0.5396 (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 64.6968	Feb 63.9902	Mar 63.2837	Apr 59.7510	May 59.0444	Jun 57.3261	Jul 57.3261	Aug 57.3261	Sep 57.3261	Oct 59.0444	Nov 60.4575	Dec 61.8706 (38)
Heat transfer coeff	176.7488	176.0423	175.3357	171.8030	171.0964	169.3781	169.3781	169.3781	169.3781	171.0964	172.5095	173.9226 (39)
Average = Sum(39)m / 12 =												172.1723 (39)
HLP	Jan 1.2896	Feb 1.2844	Mar 1.2793	Apr 1.2535	May 1.2483	Jun 1.2358	Jul 1.2358	Aug 1.2358	Sep 1.2358	Oct 1.2483	Nov 1.2586	Dec 1.2690 (40)
HLP (average)												1.2562 (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:												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
Northeast				4.2500	11.2829	0.7200	0.7000	0.7700					16.7485	(75)
Southeast				4.1300	36.7938	0.7200	0.7000	0.7700					53.0749	(77)
Southwest				0.6000	36.7938	0.7200	0.7000	0.7700					7.7106	(79)
Northwest				8.2400	11.2829	0.7200	0.7000	0.7700					32.4723	(81)
Southeast				4.5200	36.7938	0.7200	0.7000	0.7700					58.0868	(77)
Southwest				1.4600	26.0000	0.6300	0.7000	1.0000					15.0663	(82)
Solar gains	183.1594	333.9654	513.1873	726.6465	894.2432	922.4410	874.9554	745.0669	586.5781	384.4732	223.4367	154.0950	(83)	
Total gains	952.7008	1098.0058	1248.6751	1417.6403	1539.0642	1526.4602	1455.5360	1335.4706	1202.9610	1045.5861	934.2236	903.0570	(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	18.9265	19.0025	19.0791	19.4714	19.5518	19.7501	19.7501	19.7501	19.7501	19.5518	19.3916	19.2341
alpha	2.2618	2.2668	2.2719	2.2981	2.3035	2.3167	2.3167	2.3167	2.3167	2.3035	2.2928	2.2823
util living area	0.9462	0.9252	0.8879	0.8160	0.7088	0.5729	0.4526	0.4996	0.6883	0.8535	0.9264	0.9516 (86)
MIT	18.2600	18.5655	19.0770	19.7517	20.3215	20.7146	20.8821	20.8476	20.5359	19.7970	18.9293	18.2232 (87)
Th 2	19.8490	19.8531	19.8571	19.8774	19.8815	19.8915	19.8915	19.8915	19.8915	19.8815	19.8734	19.8652 (88)
util rest of house	0.9386	0.9148	0.8718	0.7887	0.6636	0.5020	0.3563	0.4028	0.6247	0.8257	0.9144	0.9447 (89)
MIT 2	16.2216	16.6621	17.3956	18.3552	19.1297	19.6321	19.8140	19.7847	19.4335	18.4421	17.2034	16.1761 (90)
Living area fraction	16.4688	16.8929	17.5995	18.5245	19.2742	19.7633	19.9435	19.9136	19.5672	18.6064	17.4127	16.4244 (92)
Temperature adjustment	16.3188	16.7429	17.4495	18.3745	19.1242	19.6133	19.7935	19.7636	19.4172	18.4564	17.2627	16.2744 (93)

FULL SAP CALCULATION PRINTOUT

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	0.9030	0.8738	0.8258	0.7433	0.6281	0.4823	0.3471	0.3905	0.5927	0.7791	0.8738	0.9114	(94)
Useful gains	860.2709	959.4626	1031.1543	1053.7863	966.6419	736.1615	505.2595	521.4615	713.0355	814.6569	816.3230	823.0348	(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	2124.3101	2084.8547	1919.8335	1627.7526	1270.2582	849.1481	540.9050	569.7161	900.6114	1344.2093	1753.1583	2100.0071	(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	940.4452	756.2635	661.1774	413.2558	225.8906	0.0000	0.0000	0.0000	0.0000	393.9870	674.5215	950.0674	(98)
Space heating												5015.6082	(98)
Space heating per m2												(98) / (4) =	36.5943 (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													5535.9914 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	940.4452	756.2635	661.1774	413.2558	225.8906	0.0000	0.0000	0.0000	0.0000	393.9870	674.5215	950.0674	(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)	1038.0190	834.7279	729.7764	456.1322	249.3274	0.0000	0.0000	0.0000	0.0000	434.8642	744.5049	1048.6395	(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	88.3923	88.2284	87.8756	87.0868	85.6067	79.9000	79.9000	79.9000	79.9000	86.8855	87.9497	88.4532	(216)
(217)m	243.9271	215.2622	226.6600	204.5779	203.6155	194.4242	186.2401	205.0298	204.8766	212.6490	222.6918	237.7453	(217)
Fuel for water heating, kWh/month												2557.6993	(219)
Water heating fuel used													
Annual totals kWh/year													
Space heating fuel - main system													5535.9914 (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 * 1004 * 1.00) =										-795.1650			-795.1650 (233)
Total delivered energy for all uses													7967.5602 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	5535.9914	3.4800	192.6525 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2557.6993	3.4800	89.0079 (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	-795.1650	13.1900	-104.8823 (252)
Total energy cost			385.0238 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):			0.4200 (256)
Energy cost factor (ECF)			0.8882 (257)
SAP value		[(255) x (256)] / [(4) + 45.0] =	87.6093
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	5535.9914	0.2160	1195.7741 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2557.6993	0.2160	552.4630 (264)
Space and water heating			1748.2372 (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	-795.1650	0.5190	-412.6906 (269)
Total kg/year			1682.7754 (272)
CO2 emissions per m2			12.2800 (273)
EI value			87.6144
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	$3.48 / 0.8501 = 4.094$, stars = 4
Water heating environmental impact	$0.216 / 0.8501 = 0.2541$, 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								4.9300				
Infiltration rate								0.2465	(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) =	0.2465 (21)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	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)
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												
	0.2712	0.2527	0.2527	0.2403	0.2403	0.2280	0.2280	0.2157	0.2157	0.2342	0.2280	0.2403 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5212	0.5027	0.5027	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 59.7510	Feb 57.6313	Mar 57.6313	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	171.8030	169.6834	169.6834	169.3781	169.3781	169.3781	169.3781	169.3781	169.3781	169.3781	169.3781	169.3781 (39)
Average = Sum(39)m / 12 =												169.6310 (39)

HLP	Jan 1.2535	Feb 1.2380	Mar 1.2380	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)												1.2376 (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 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	
Northeast				4.2500	14.6176	0.7200	0.7000	0.7700			21.6985 (75)	
Southeast				4.1300	45.1778	0.7200	0.7000	0.7700			65.1687 (77)	
Southwest				0.6000	45.1778	0.7200	0.7000	0.7700			9.4676 (79)	
Northwest				8.2400	14.6176	0.7200	0.7000	0.7700			42.0696 (81)	
Southeast				4.5200	45.1778	0.7200	0.7000	0.7700			71.3227 (77)	
Southwest				1.4600	34.0000	0.6300	0.7000	1.0000			19.7021 (82)	
Solar gains	229.4292	357.5204	557.2212	797.8674	930.3050	1052.3678	962.9919	854.8910	669.2696	439.4585	279.2912	182.5203 (83)
Total gains	998.9706	1121.5608	1292.7090	1488.8613	1575.1259	1656.3871	1543.5724	1445.2947	1285.6525	1100.5714	990.0781	931.4823 (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	19.4714	19.7146	19.7146	19.7501	19.7501	19.7501	19.7501	19.7501	19.7501	19.7501	19.7501	19.7501
alpha	2.2981	2.3143	2.3143	2.3167	2.3167	2.3167	2.3167	2.3167	2.3167	2.3167	2.3167	2.3167
util living area	0.9325	0.9112	0.8620	0.7723	0.6398	0.4591	0.3394	0.3593	0.5939	0.8021	0.9019	0.9396 (86)
MIT	18.6328	18.9031	19.4216	20.0281	20.5500	20.8591	20.9522	20.9460	20.7249	20.1258	19.3088	18.6155 (87)
Th 2	19.8774	19.8897	19.8897	19.8915	19.8915	19.8915	19.8915	19.8915	19.8915	19.8915	19.8915	19.8915 (88)
util rest of house	0.9226	0.8985	0.8419	0.7385	0.5834	0.3762	0.2337	0.2485	0.5130	0.7630	0.8852	0.9306 (89)
MIT 2	16.7736	17.1660	17.9019	18.7425	19.4298	19.7859	19.8706	19.8676	19.6556	18.8999	17.7563	16.7571 (90)
Living area fraction	0.1213	0.1213	0.1213	0.1213	0.1213	0.1213	0.1213	0.1213	0.1213	0.1213	0.1213	0.1213 (91)
MIT	16.9990	17.3766	18.0861	18.8984	19.5656	19.9161	20.0017	19.9984	19.7853	19.0486	17.9446	16.9825 (92)
Temperature adjustment	-0.1500	-0.1500	-0.1500	-0.1500	-0.1500	-0.1500	-0.1500	-0.1500	-0.1500	-0.1500	-0.1500	-0.1500
adjusted MIT	16.8490	17.2266	17.9361	18.7484	19.4156	19.7661	19.8517	19.8484	19.6353	18.8986	17.7946	16.8325 (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	0.8838	0.8561	0.7960	0.6968	0.5561	0.3661	0.2297	0.2440	0.4919	0.7191	0.8412	0.8940	(94)
Useful gains	882.9345	960.2056	1028.9996	1037.4789	875.9855	606.4731	354.5464	352.6185	632.3657	791.4349	832.8913	832.7002	(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													
	1966.9798	1921.9376	1753.8706	1481.7822	1069.7267	654.8247	364.4553	363.8862	734.3007	1168.4712	1591.2340	1919.4724	(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													
	806.5297	646.2839	539.3041	319.8984	144.1435	0.0000	0.0000	0.0000	0.0000	280.5150	546.0067	808.5585	(98)
Space heating													4091.2397 (98)
Space heating per m2											(98) / (4) =	29.8500	(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													4515.7171	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	806.5297	646.2839	539.3041	319.8984	144.1435	0.0000	0.0000	0.0000	0.0000	280.5150	546.0067	808.5585	(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)	890.2093	713.3376	595.2584	353.0888	159.0988	0.0000	0.0000	0.0000	0.0000	309.6192	602.6564	892.4487	(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	88.1110	87.9257	87.4417	86.4583	84.4125	79.9000	79.9000	79.9000	79.9000	86.0253	87.5062	88.1631	(217)	
Fuel for water heating, kWh/month	244.7059	216.0033	227.7848	206.0648	206.4962	194.4242	186.2401	205.0298	204.8766	214.7752	223.8203	238.5278	(219)	
Water heating fuel used												2568.7489	(219)	
Annual totals kWh/year														
Space heating fuel - main system												4515.7171	(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 * 1115 * 1.00) =										-882.9989		-882.9989	(233)	
Total delivered energy for all uses												6870.5016	(238)	

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	4515.7171	10.2300	461.9579	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	2568.7489	10.2300	262.7830	(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	-882.9989	36.7200	-324.2372	(252)
Total energy cost			749.1731	(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	4515.7171	0.2160	975.3949	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2568.7489	0.2160	554.8498	(264)
Space and water heating			1530.2447	(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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CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

PV Unit	-882.9989	0.5190	-458.2764 (269)
Total kg/year			1419.1971 (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	4515.7171	1.2200	5509.1749 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2568.7489	1.2200	3133.8736 (264)
Space and water heating			8643.0485 (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	-882.9989	3.0700	-2710.8066 (269)
Primary energy kWh/year			7986.1777 (272)
Primary energy kWh/m2/year			58.2677 (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 (18.9%)

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	£828	£688	£140
Space heating	£628	£631	-£3
Water heating	£263	£139	£124
Lighting	£182	£182	£0
Generated (PV)	-£324	-£324	£0
Total cost of fuels	£750	£628	£122
Total cost of uses	£749	£628	£121
Delivered energy	50 kWh/m²	41 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	1.2 tonnes	0.3 tonnes
CO2 emissions per m ²	10 kg/m ²	8 kg/m ²	2 kg/m ²
Primary energy	58 kWh/m ²	47 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					4.9300
Infiltration rate					0.2465 (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) =				0.2465 (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	0.3143	0.3081	0.3020	0.2712	0.2650	0.2342	0.2342	0.2280	0.2465	0.2650	0.2773	0.2896 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
Effective ac	0.5643	0.5581	0.5520	0.5212	0.5150	0.5000	0.5000	0.5000	0.5000	0.5150	0.5273	0.5396 (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	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	64.6968	63.9902	63.2837	59.7510	59.0444	57.3261	57.3261	57.3261	57.3261	59.0444	60.4575	61.8706 (38)
Average = Sum(39)m / 12 =	176.7488	176.0423	175.3357	171.8030	171.0964	169.3781	169.3781	169.3781	169.3781	171.0964	172.5095	173.9226 (39)
												172.1723 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2896	1.2844	1.2793	1.2535	1.2483	1.2358	1.2358	1.2358	1.2358	1.2483	1.2586	1.2690 (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:												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												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)
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)
Total per year (kWh/year) = Sum(64)m =												1070.2349 (64)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	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

Northeast					4.2500	11.2829	0.7200	0.7000				0.7700			16.7485 (75)
Southeast					4.1300	36.7938	0.7200	0.7000				0.7700			53.0749 (77)
Southwest					0.6000	36.7938	0.7200	0.7000				0.7700			7.7106 (79)
Northwest					8.2400	11.2829	0.7200	0.7000				0.7700			32.4723 (81)
Southeast					4.5200	36.7938	0.7200	0.7000				0.7700			58.0868 (77)
Southwest					1.4600	26.0000	0.6300	0.7000				1.0000			15.0663 (82)

Solar gains	183.1594	333.9654	513.1873	726.6465	894.2432	922.4410	874.9554	745.0669	586.5781	384.4732	223.4367	154.0950			(83)
Total gains	943.5722	1088.8772	1238.0457	1401.0078	1516.1782	1503.3242	1432.4000	1313.3351	1187.8293	1034.9567	925.0950	893.9284			(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	18.9265	19.0025	19.0791	19.4714	19.5518	19.7501	19.7501	19.7501	19.7501	19.5518	19.3916	19.2341
alpha	2.2618	2.2668	2.2719	2.2981	2.3035	2.3167	2.3167	2.3167	2.3167	2.3035	2.2928	2.2823
util living area	0.9471	0.9263	0.8895	0.8191	0.7139	0.5786	0.4582	0.5058	0.6928	0.8559	0.9277	0.9525 (86)
MIT	18.2496	18.5558	19.0669	19.7393	20.3100	20.7083	20.8789	20.8435	20.5289	19.7880	18.9195	18.2126 (87)
Th 2	19.8490	19.8531	19.8571	19.8774	19.8815	19.8915	19.8915	19.8915	19.8915	19.8815	19.8734	19.8652 (88)
util rest of house	0.9396	0.9160	0.8735	0.7922	0.6690	0.5076	0.3613	0.4083	0.6294	0.8284	0.9159	0.9458 (89)
MIT 2	16.2069	16.6484	17.3817	18.3387	19.1158	19.6258	19.8116	19.7815	19.4258	18.4301	17.1896	16.1610 (90)
Living area fraction									fLA = Living area / (4) =			0.1213 (91)
MIT	16.4546	16.8797	17.5860	18.5085	19.2606	19.7570	19.9411	19.9103	19.5595	18.5948	17.3993	16.4098 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.3046	16.7297	17.4360	18.3585	19.1106	19.6070	19.7911	19.7603	19.4095	18.4448	17.2493	16.2598 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9044	0.8753	0.8277	0.7466	0.6329	0.4874	0.3518	0.3956	0.5969	0.7817	0.8755	0.9128 (94)
Useful gains	853.3389	953.0810	1024.6916	1045.9984	959.6300	732.6579	503.8561	519.5845	709.0646	809.0742	809.9529	815.9459 (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	2121.7945	2082.5244	1917.4738	1625.0039	1267.9290	848.0796	540.4951	569.1592	899.3182	1342.2142	1750.8580	2097.4671 (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	943.7310	758.9860	664.2299	416.8840	229.3745	0.0000	0.0000	0.0000	0.0000	396.6562	677.4517	953.4517 (98)
Space heating												5040.7649 (98)
Space heating per m2										(98) / (4) =		36.7778 (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	5563.7582 (211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	943.7310	758.9860	664.2299	416.8840	229.3745	0.0000	0.0000	0.0000	0.0000	396.6562	677.4517	953.4517 (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)	1041.6457	837.7329	733.1456	460.1368	253.1727	0.0000	0.0000	0.0000	0.0000	437.8104	747.7392	1052.3750 (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 (217)m	88.6996	88.7868	88.8892	89.1221	89.4566	79.9000	79.9000	79.9000	79.9000	87.9272	88.3940	79.9000 (216)
Fuel for water heating, kWh/month	202.6462	153.8182	125.4239	66.1076	27.0549	9.8495	2.8915	42.6007	80.7965	132.4671	175.5415	201.6324 (219)
Water heating fuel used												1220.8300 (219)
Annual totals kWh/year												
Space heating fuel - main system												5563.7582 (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 * 1004 * 1.00) =	-795.1650	-795.1650 (233)
Total delivered energy for all uses		6708.4577 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	5563.7582	3.4800	193.6188 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1220.8300	3.4800	42.4849 (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	-795.1650	13.1900	-104.8823 (252)
Total energy cost			346.0621 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.7983 (257)
SAP value		88.8631
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	5563.7582	0.2160	1201.7718 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1220.8300	0.2160	263.6993 (264)
Space and water heating			1465.4711 (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	-795.1650	0.5190	-412.6906 (269)
Total kg/year			1425.9593 (272)
CO2 emissions per m2			10.4000 (273)
EI value			89.5046
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	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					4.9300
Infiltration rate					0.2465 (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) =				0.2465 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	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)
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	0.2712	0.2527	0.2527	0.2403	0.2403	0.2280	0.2280	0.2157	0.2157	0.2342	0.2280	0.2403 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
Effective ac	0.5212	0.5027	0.5027	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	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	59.7510	57.6313	57.6313	57.3261	57.3261	57.3261	57.3261	57.3261	57.3261	57.3261	57.3261	57.3261 (38)
Heat transfer coeff	171.8030	169.6834	169.6834	169.3781	169.3781	169.3781	169.3781	169.3781	169.3781	169.3781	169.3781	169.3781 (39)
Average = Sum(39)m / 12 =												169.6310 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2535	1.2380	1.2380	1.2358	1.2358	1.2358	1.2358	1.2358	1.2358	1.2358	1.2358	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
Northeast				4.2500	14.6176		0.7200		0.7000		0.7700		21.6985 (75)
Southeast				4.1300	45.1778		0.7200		0.7000		0.7700		65.1687 (77)
Southwest				0.6000	45.1778		0.7200		0.7000		0.7700		9.4676 (79)
Northwest				8.2400	14.6176		0.7200		0.7000		0.7700		42.0696 (81)
Southeast				4.5200	45.1778		0.7200		0.7000		0.7700		71.3227 (77)
Southwest				1.4600	34.0000		0.6300		0.7000		1.0000		19.7021 (82)
Solar gains	229.4292	357.5204	557.2212	797.8674	930.3050	1052.3678	962.9919	854.8910	669.2696	439.4585	279.2912	182.5203	(83)
Total gains	989.8420	1112.4322	1282.0797	1472.2287	1552.2400	1633.2511	1520.4364	1423.1592	1270.5208	1089.9421	980.9495	922.3537	(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	19.4714	19.7146	19.7146	19.7501	19.7501	19.7501	19.7501	19.7501	19.7501	19.7501	19.7501	19.7501
alpha	2.2981	2.3143	2.3143	2.3167	2.3167	2.3167	2.3167	2.3167	2.3167	2.3167	2.3167	2.3167
util living area	0.9336	0.9124	0.8638	0.7757	0.6452	0.4641	0.3439	0.3641	0.5983	0.8048	0.9034	0.9407 (86)
MIT	18.6227	18.8937	19.4123	20.0175	20.5414	20.8558	20.9508	20.9444	20.7203	20.1183	19.2997	18.6052 (87)
Th 2	19.8774	19.8897	19.8897	19.8915	19.8915	19.8915	19.8915	19.8915	19.8915	19.8915	19.8915	19.8915 (88)
util rest of house	0.9239	0.8999	0.8439	0.7422	0.5889	0.3807	0.2370	0.2521	0.5174	0.7660	0.8869	0.9319 (89)
MIT 2	16.7594	17.1528	17.8891	18.7288	19.4202	19.7832	19.8699	19.8669	19.6512	18.8903	17.7436	16.7425 (90)
Living area fraction									fLA = Living area / (4) =			0.1213 (91)
MIT	16.9853	17.3639	18.0738	18.8850	19.5561	19.9133	20.0010	19.9975	19.7809	19.0392	17.9323	16.9683 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.8353	17.2139	17.9238	18.7350	19.4061	19.7633	19.8510	19.8475	19.6309	18.8892	17.7823	16.8183 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8854	0.8577	0.7980	0.7002	0.5611	0.3703	0.2329	0.2474	0.4958	0.7219	0.8432	0.8955 (94)
Useful gains	876.3834	954.1664	1023.1291	1030.8806	870.9072	604.8488	354.1233	352.1335	629.9514	786.8720	827.1094	825.9663 (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	1964.6261	1919.7751	1751.7804	1479.5237	1068.1186	654.3532	364.3305	363.7427	733.5556	1166.8857	1589.1629	1917.0798 (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	809.6525	648.8890	542.1165	323.0230	146.7253	0.0000	0.0000	0.0000	0.0000	282.7302	548.6785	811.7884 (98)
Space heating												4113.6036 (98)
Space heating per m2										(98) / (4) =		30.0132 (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												4540.4013 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	809.6525	648.8890	542.1165	323.0230	146.7253	0.0000	0.0000	0.0000	0.0000	282.7302	548.6785	811.7884 (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)	893.6562	716.2131	598.3626	356.5375	161.9485	0.0000	0.0000	0.0000	0.0000	312.0642	605.6054	896.0137 (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 (217)m	88.4947	88.5400	88.5905	88.8175	88.6494	79.9000	79.9000	79.9000	79.9000	87.2742	88.0740	79.9000 (216)
Fuel for water heating, kWh/month	197.6415	154.0979	124.7841	64.1129	32.5421	0.7986	0.0000	33.8833	74.2305	128.8515	169.7802	199.2300 (219)
Water heating fuel used												1179.9529 (219)
Annual totals kWh/year												
Space heating fuel - main system												4540.4013 (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 * 1115 * 1.00) =										-882.9989		-882.9989 (233)
Total delivered energy for all uses												5556.3897 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	4540.4013	10.2300	464.4831 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1179.9529	10.2300	120.7092 (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	-882.9989	36.7200	-324.2372 (252)
Total energy cost			627.9845 (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	4540.4013	0.2160	980.7267 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1179.9529	0.2160	254.8698 (264)
Space and water heating			1235.5965 (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	-882.9989	0.5190	-458.2764 (269)
Total kg/year			1150.4990 (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	4540.4013	1.2200	5539.2896 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1179.9529	1.2200	1439.5425 (264)
Space and water heating			6978.8320 (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	-882.9989	3.0700	-2710.8066 (269)
Primary energy kWh/year			6475.4612 (272)
Primary energy kWh/m2/year			47.2454 (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 West
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 East	0.000	1.000	None
South East	0.000	1.000	None
South West	0.000	1.000	None
North West	0.000	1.000	None

Solar shading	Z blinds	Solar access	Z overhangs	Z summer
Orientation				
North East	1.000	0.90	1.000	0.900 (P8)
South East	1.000	0.90	1.000	0.900 (P8)
South West	1.000	0.90	1.000	0.900 (P8)
South West	1.000	1.00	1.000	1.000 (P8)
North West	1.000	0.90	1.000	0.900 (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 East	4.2500	106.0502	0.7200	0.7000	0.9000	183.9992
South East	4.1300	127.3119	0.7200	0.7000	0.9000	214.6518
South West	0.6000	127.3119	0.7200	0.7000	0.9000	31.1843
North West	8.2400	106.0502	0.7200	0.7000	0.9000	356.7421
South East	4.5200	127.3119	0.7200	0.7000	0.9000	234.9215
South 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:				1147.2448
	Jun	Jul	Aug	
Solar gains	1239	1147	997	(P3)
Internal gains	601	578	587	
Total summer gains	1840	1725	1585	(P5)
Summer gain/loss ratio	3.22	3.02	2.78	(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	20.01	21.71	21.46	(P7)
Likelihood of high internal temperature	Not significant	Slight	Slight	
Assessment of likelihood of high internal temperature:	Slight			