

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



Property Reference	4907-T511-3796-128				Issued on Date	29/09/2022
Assessment Reference	As Built	Prop Type Ref	FLv1 Det Op			
Property	29 Pembers Farm Avenue, Fair Oak, EASTLEIGH, SO50 7QL					
SAP Rating	88 B	DER	12.29	TER	15.26	
Environmental	88 B	% DER<TER	19.47			
CO ₂ Emissions (t/year)	1.69	DFEE	47.54	TFEE	56.24	
General Requirements Compliance	Pass	% DFEE<TFEE	15.47			
Assessor Details	Miss Lindsey Dean, Lindsey Dean, Tel: 01884 242050, Lindsey.dean@aessc.co.uk				Assessor ID	T510-0001
Client	Drew Smith					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

DWELLING AS BUILT

Detached House, total floor area 171 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) 15.26 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 12.29 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)56.2 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)47.5 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	1.40 (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: 4.71 (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: 4.02 m², No overhang
Windows facing South East: 12.91 m², No overhang
Windows facing North West: 12.31 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 0.96 kW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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	65.4500 (1b)	x 2.4000 (2b)	= 157.0800 (1b) - (3b)
First floor	64.4100 (1c)	x 2.6900 (2c)	= 173.2629 (1c) - (3c)
Second floor	40.9400 (1d)	x 2.3900 (2d)	= 97.8466 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	170.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 428.1895 (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)
					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					4.7100
Infiltration rate					0.2355 (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) =	0.2355 (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	0.3003	0.2944	0.2885	0.2591	0.2532	0.2237	0.2237	0.2178	0.2355	0.2532	0.2649	0.2767 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												
Effective ac	0.5503	0.5444	0.5385	0.5091	0.5032	0.5000	0.5000	0.5000	0.5000	0.5032	0.5149	0.5267 (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			4.2500	1.3000	5.5250		(26)
Window (Uw = 1.40)			24.0200	1.3258	31.8447		(27)
French Door (Uw = 1.40)			5.2200	1.3258	6.9205		(27)
Roof Window (Uw = 1.80)			0.9000	1.6791	1.5112		(27a)
150mm EPS B&B			51.3600	0.1800	9.2448	75.0000	3852.0000 (28a)
140mm Timber Frame	193.8600	29.9000	163.9600	0.1900	31.1524	9.0000	1475.6400 (29a)
W2V	14.8500		14.8500	0.1400	2.0790	18.0000	267.3000 (29a)
Dormer Cheek	11.9700	3.5900	8.3800	0.3200	2.6816	18.0000	150.8400 (29a)
400mm Mineral Wool	14.7000		14.7000	0.1100	1.6170	9.0000	132.3000 (30)
Bay Flat	1.0500		1.0500	0.2500	0.2625	9.0000	9.4500 (30)
Sloping	23.4900	0.9000	22.5900	0.2000	4.5180	9.0000	203.3100 (30)
Dormer Roof	8.5000		8.5000	0.2800	2.3800	9.0000	76.5000 (30)
C2V	23.4700		23.4700	0.1400	3.2858	9.0000	211.2300 (30)
Total net area of external elements Aum(A, m ²)			343.2500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	103.0224		(33)
Timber GF			114.3800			9.0000	1029.4200 (32c)
Timber FF			133.7300			9.0000	1203.5700 (32c)
Timber 2F			56.7900			9.0000	511.1100 (32c)
Internal Floor			64.4100			18.0000	1159.3800 (32d)
Internal Floor 2			40.9400			18.0000	736.9200 (32d)
Internal Ceiling			64.4100			18.0000	1159.3800 (32e)
Internal Ceiling 2			40.9400			18.0000	736.9200 (32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12915.2700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		75.6163 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)		21.9013 (36)
Total fabric heat loss	(33) + (36) =	124.9237 (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	77.7535	76.9216	76.0896	71.9301	71.0981	70.6513	70.6513	70.6513	70.6513	71.0981	72.7620	74.4258 (38)
Heat transfer coeff	202.6772	201.8453	201.0134	196.8538	196.0219	195.5750	195.5750	195.5750	195.5750	196.0219	197.6857	199.3495 (39)
Average = Sum(39)m / 12 =												197.8140 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1866	1.1818	1.1769	1.1525	1.1477	1.1451	1.1451	1.1451	1.1451	1.1477	1.1574	1.1672 (40)
HLP (average)												1.1582 (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 DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.9636 (42)											
Average daily hot water use (litres/day)	104.5865 (43)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	115.0452	110.8617	106.6783	102.4948	98.3113	94.1279	94.1279	98.3113	102.4948	106.6783	110.8617	115.0452 (44)
Energy content (annual)	170.6087	149.2154	153.9770	134.2409	128.8073	111.1509	102.9976	118.1913	119.6029	139.3856	152.1503	165.2254 (45)
Distribution loss (46)m = 0.15 x (45)m	25.5913											
Water storage loss:	25.5913	22.3823	23.0965	20.1361	19.3211	16.6726	15.4496	17.7287	17.9404	20.9078	22.8225	24.7838 (46)
Store volume	210.0000 (47)											
a) If manufacturer declared loss factor is known (kWh/day):	1.4200 (48)											
Temperature factor from Table 2b	0.5400 (49)											
Enter (49) or (54) in (55)	0.7668 (55)											
Total storage loss	23.7708	21.4704	23.7708	23.0040	23.7708	23.0040	23.7708	23.7708	23.0040	23.7708	23.0040	23.7708 (56)
If cylinder contains dedicated solar storage	23.7708	21.4704	23.7708	23.0040	23.7708	23.0040	23.7708	23.7708	23.0040	23.7708	23.0040	23.7708 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	217.6419	191.6970	201.0102	179.7569	175.8405	156.6669	150.0308	165.2245	165.1189	186.4188	197.6663	212.2586 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	217.6419	191.6970	201.0102	179.7569	175.8405	156.6669	150.0308	165.2245	165.1189	186.4188	197.6663	212.2586 (64)
Heat gains from water heating, kWh/month	94.3539	83.5994	88.8239	81.0479	80.4550	73.3705	71.8733	76.9252	76.1808	83.9723	87.0028	92.5640 (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	148.1822	148.1822	148.1822	148.1822	148.1822	148.1822	148.1822	148.1822	148.1822	148.1822	148.1822	148.1822 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	31.2436	27.7503	22.5680	17.0855	12.7716	10.7823	11.6507	15.1440	20.3262	25.8088	30.1227	32.1119 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	342.3647	345.9174	336.9648	317.9057	293.8470	271.2353	256.1292	252.5766	261.5292	280.5883	304.6469	327.2587 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.8182	37.8182	37.8182	37.8182	37.8182	37.8182	37.8182	37.8182	37.8182	37.8182	37.8182	37.8182 (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)	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457 (71)
Water heating gains (Table 5)	126.8198	124.4039	119.3870	112.5665	108.1384	101.9034	96.6039	103.3940	105.8066	112.8660	120.8372	124.4140 (72)
Total internal gains	570.8828	568.5262	549.3744	518.0123	485.2117	454.3757	434.8384	441.5692	458.1166	489.7177	526.0614	554.2392 (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				4.0200	11.2829		0.7200		0.7000		0.7700		15.8421 (75)
Southeast				12.9100	36.7938		0.7200		0.7000		0.7700		165.9071 (77)
Northwest				7.0900	11.2829		0.7200		0.7000		0.7700		27.9404 (81)
Northwest				5.2200	11.2829		0.7200		0.7000		0.7700		20.5711 (81)
Northwest				0.9000	26.0000		0.6300		0.7000		1.0000		9.2875 (82)
Solar gains	239.5481	432.8840	656.9680	920.2748	1126.2178	1159.6362	1100.7472	941.0251	747.3381	495.9948	291.4798	202.0377	(83)
Total gains	810.4309	1001.4102	1206.3424	1438.2871	1611.4295	1614.0118	1535.5856	1382.5943	1205.4548	985.7124	817.5412	756.2769	(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	17.7009	17.7739	17.8474	18.2246	18.3019	18.3437	18.3437	18.3437	18.3437	18.3019	18.1479	17.9964
alpha	2.1801	2.1849	2.1898	2.2150	2.2201	2.2229	2.2229	2.2229	2.2229	2.2201	2.2099	2.1998
util living area	0.9659	0.9459	0.9097	0.8385	0.7308	0.5986	0.4800	0.5340	0.7277	0.8861	0.9508	0.9704 (86)
MIT	17.8573	18.2135	18.7964	19.5600	20.2082	20.6493	20.8483	20.8019	20.4199	19.5704	18.5918	17.8165 (87)
Th 2	19.9307	19.9346	19.9385	19.9582	19.9621	19.9642	19.9642	19.9642	19.9642	19.9621	19.9542	19.9464 (88)
util rest of house	0.9614	0.9388	0.8975	0.8159	0.6912	0.5337	0.3887	0.4429	0.6724	0.8653	0.9432	0.9665 (89)
MIT 2	15.7144	16.2299	17.0695	18.1612	19.0543	19.6268	19.8544	19.8119	19.3598	18.1992	16.7906	15.6603 (90)
Living area fraction	15.9310	16.4305	17.2441	18.3027	19.1710	19.7302	19.9549	19.9120	19.4670	18.3378	16.9727	15.8783 (92)
Temperature adjustment	15.7810	16.2805	17.0941	18.1527	19.0210	19.5802	19.8049	19.7620	19.3170	18.1878	16.8227	-0.1500
adjusted MIT	15.7810	16.2805	17.0941	18.1527	19.0210	19.5802	19.8049	19.7620	19.3170	18.1878	16.8227	15.7283 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9323	0.9010	0.8508	0.7657	0.6487	0.5066	0.3733	0.4230	0.6306	0.8157	0.9071	0.9401 (94)
Useful gains	755.5273	902.2969	1026.3046	1101.2276	1045.2690	817.6175	573.1925	584.8219	760.1266	804.0396	741.6195	710.9763 (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	2326.9439	2297.0969	2129.5633	1821.4199	1435.0781	974.0005	626.7907	657.5316	1020.3134	1487.3844	1922.0459	2298.1626 (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	1169.1339	937.3056	820.8245	518.5384	290.0179	0.0000	0.0000	0.0000	0.0000	508.4086	849.9070	1180.8666 (98)
Space heating												6275.0025 (98)
Space heating per m2												36.7389 (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	6926.0513	(211)

[illegible][illegible]

Electricity for pumps and fans:

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

mechanical ventilation fans (SFP = 0.2308)

central heating pump

central heating pump
main heating flue fan

Total electricity for the above, kWh/year

Total electricity for the above, kWh/year
Electricity for lighting (calculated in Appendix L)

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

PV Unit 0 $(0.80 * 0.96 * 853 * 1.00) =$

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	6926.0513	0.2160	1496.0271	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2571.7211	0.2160	555.4918	(264)
Space and water heating			2051.5189	(265)
Pumps and fans	195.5738	0.5190	101.5028	(267)
Energy for lighting	551.7714	0.5190	286.3693	(268)
Energy saving/generation technologies				
PV Unit	-655.1270	0.5190	-340.0109	(269)
Total CO2, kg/year			2099.3801	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			12.2900	(273)

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

DER		12.2900	ZC1
Total Floor Area	TFA	170.8000	
Assumed number of occupants	N	2.9636	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		11.8781	ZC2
CO2 emissions from cooking, equation (L16)		1.1132	ZC3
Total CO2 emissions		25.2813	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m ² /year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		25.2813	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	65.4500 (1b)	x 2.4000 (2b)	= 157.0800 (1b) - (3b)
First floor	64.4100 (1c)	x 2.6900 (2c)	= 173.2629 (1c) - (3c)
Second floor	40.9400 (1d)	x 2.3900 (2d)	= 97.8466 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	170.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	428.1895 (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) =	0.0934 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3434 (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) =		0.3434 (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	0.4379	0.4293	0.4207	0.3778	0.3692	0.3262	0.3262	0.3177	0.3434	0.3692	0.3863	0.4035 (22b)
Effective ac	0.5959	0.5921	0.5885	0.5714	0.5681	0.5532	0.5532	0.5505	0.5590	0.5681	0.5746	0.5814 (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			4.2500	1.0000	4.2500		(26)
TER Opening Type (Uw = 1.40)			29.2400	1.3258	38.7652		(27)
TER Room Window (Uw = 1.70)			0.9000	1.5918	1.4326		(27a)
150mm EPS B&B			51.3600	0.1300	6.6768		(28a)
140mm Timber Frame	193.8600	29.9000	163.9600	0.1800	29.5128		(29a)
W2V	14.8500		14.8500	0.1800	2.6730		(29a)
Dormer Cheek	11.9700	3.5900	8.3800	0.1800	1.5084		(29a)
400mm Mineral Wool	14.7000		14.7000	0.1300	1.9110		(30)
Bay Flat	1.0500		1.0500	0.1300	0.1365		(30)
Sloping	23.4900	0.9000	22.5900	0.1300	2.9367		(30)
Dormer Roof	8.5000		8.5000	0.1300	1.1050		(30)
C2V	23.4700		23.4700	0.1300	3.0511		(30)
Total net area of external elements Aum(A, m ²)			343.2500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		93.9590		(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)							17.4975 (36)
Total fabric heat loss						(33) + (36) =	111.4565 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 84.1964	Feb 83.6704	Mar 83.1549	Apr 80.7333	May 80.2802	Jun 78.1711	Jul 78.1711	Aug 77.7806	Sep 78.9835	Oct 80.2802	Nov 81.1968	Dec 82.1550 (38)
Heat transfer coeff	195.6529	195.1269	194.6114	192.1898	191.7368	189.6277	189.6277	189.2371	190.4401	191.7368	192.6533	193.6115 (39)
Average = Sum(39)m / 12 =												192.1877 (39)
HLP	Jan 1.1455	Feb 1.1424	Mar 1.1394	Apr 1.1252	May 1.1226	Jun 1.1102	Jul 1.1102	Aug 1.1079	Sep 1.1150	Oct 1.1226	Nov 1.1279	Dec 1.1336 (40)
HLP (average)												1.1252 (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												2.9636 (42)
Average daily hot water use (litres/day)												104.5865 (43)
Daily hot water use	Jan 115.0452	Feb 110.8617	Mar 106.6783	Apr 102.4948	May 98.3113	Jun 94.1279	Jul 94.1279	Aug 98.3113	Sep 102.4948	Oct 106.6783	Nov 110.8617	Dec 115.0452 (44)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Energy conte	170.6087	149.2154	153.9770	134.2409	128.8073	111.1509	102.9976	118.1913	119.6029	139.3856	152.1503	165.2254 (45)
Energy content (annual)										Total = Sum (45)m =		1645.5533 (45)
Distribution loss (46)m = 0.15 x (45)m												
	25.5913	22.3823	23.0965	20.1361	19.3211	16.6726	15.4496	17.7287	17.9404	20.9078	22.8225	24.7838 (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												
	222.3553	195.9543	205.7236	184.3182	180.5539	161.2282	154.7442	169.9379	169.6802	191.1322	202.2277	216.9720 (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												
	222.3553	195.9543	205.7236	184.3182	180.5539	161.2282	154.7442	169.9379	169.6802	191.1322	202.2277	216.9720 (64)
Heat gains from water heating, kWh/month												
	98.1247	87.0052	92.5946	84.6970	84.2257	77.0196	75.6440	80.6959	79.8298	87.7430	90.6519	96.3347 (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	148.1822	148.1822	148.1822	148.1822	148.1822	148.1822	148.1822	148.1822	148.1822	148.1822	148.1822	148.1822 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	31.2436	27.7503	22.5680	17.0855	12.7716	10.7823	11.6507	15.1440	20.3262	25.8088	30.1227	32.1119 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	342.3647	345.9174	336.9648	317.9057	293.8470	271.2353	256.1292	252.5766	261.5292	280.5883	304.6469	327.2587 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	37.8182	37.8182	37.8182	37.8182	37.8182	37.8182	37.8182	37.8182	37.8182	37.8182	37.8182	37.8182 (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)												
	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457 (71)
Water heating gains (Table 5)												
	131.8880	129.4721	124.4551	117.6347	113.2066	106.9716	101.6720	108.4622	110.8748	117.9341	125.9054	129.4821 (72)
Total internal gains												
	575.9509	573.5944	554.4426	523.0804	490.2798	459.4438	439.9066	446.6374	463.1848	494.7858	531.1296	559.3074 (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					4.0200	11.2829	0.6300	0.7000	0.7700	13.8618 (75)		
Southeast					12.9100	36.7938	0.6300	0.7000	0.7700	145.1687 (77)		
Northwest					12.3100	11.2829	0.6300	0.7000	0.7700	42.4475 (81)		
Northwest					0.9000	26.0000	0.6300	0.7000	1.0000	9.2875 (82)		
Solar gains	210.7655	381.1847	579.1335	811.9382	994.0137	1023.6119	971.5929	830.4072	659.0558	436.9424	256.5183	177.7206 (83)
Total gains	786.7164	954.7790	1133.5761	1335.0186	1484.2935	1483.0557	1411.4994	1277.0446	1122.2406	931.7282	787.6479	737.0280 (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	60.6232	60.7866	60.9477	61.7156	61.8614	62.5495	62.5495	62.6786	62.2826	61.8614	61.5671	61.2624
alpha	5.0415	5.0524	5.0632	5.1144	5.1241	5.1700	5.1700	5.1786	5.1522	5.1241	5.1045	5.0842
util living area	0.9994	0.9983	0.9941	0.9742	0.9030	0.7440	0.5745	0.6487	0.8958	0.9891	0.9986	0.9996 (86)
MIT	19.6346	19.7950	20.0662	20.4339	20.7553	20.9390	20.9870	20.9767	20.8291	20.4073	19.9559	19.6124 (87)
Th 2	19.9638	19.9663	19.9688	19.9803	19.9824	19.9925	19.9925	19.9943	19.9886	19.9824	19.9781	19.9735 (88)
util rest of house												
	0.9992	0.9977	0.9918	0.9637	0.8636	0.6547	0.4515	0.5229	0.8372	0.9831	0.9980	0.9994 (89)
MIT 2	18.1273	18.3637	18.7609	19.2983	19.7346	19.9506	19.9876	19.9843	19.8411	19.2678	18.6076	18.1017 (90)
Living area fraction												
MIT	18.2797	18.5084	18.8929	19.4131	19.8378	20.0505	20.0886	20.0846	19.9410	19.3830	18.7439	18.2544 (92)
Temperature adjustment												0.0000
adjusted MIT	18.2797	18.5084	18.8929	19.4131	19.8378	20.0505	20.0886	20.0846	19.9410	19.3830	18.7439	18.2544 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9987	0.9963	0.9883	0.9557	0.8569	0.6603	0.4637	0.5349	0.8337	0.9779	0.9969	0.9990 (94)
Ext temp.	785.6682	951.2887	1120.3011	1275.9330	1271.8457	979.2849	654.4849	683.1417	935.6497	911.1284	785.1987	736.3259 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Month fracti	2735.1683	2655.3667	2411.8005	2020.5121	1560.3172	1033.5688	661.5385	697.2651	1112.3685	1684.0267	2243.2384	2721.0985 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
	1450.4280	1145.1404	960.8756	536.0969	214.6228	0.0000	0.0000	0.0000	0.0000	575.0363	1049.7885	1476.6708 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Space heating
Space heating per m2 (98) / (4) = 7408.6594 (98)
43.3762 (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													7923.6999 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1450.4280	1145.1404	960.8756	536.0969	214.6228	0.0000	0.0000	0.0000	0.0000	575.0363	1049.7885	1476.6708	(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)	1551.2599	1224.7491	1027.6744	573.3657	229.5431	0.0000	0.0000	0.0000	0.0000	615.0121	1122.7685	1579.3271	(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	222.3553	195.9543	205.7236	184.3182	180.5539	161.2282	154.7442	169.9379	169.6802	191.1322	202.2277	216.9720	(64)
Efficiency of water heater (217)m	88.9152	88.7610	88.4095	87.4983	85.2758	79.8000	79.8000	79.8000	79.8000	87.5708	88.5815	88.9717	(216)
Fuel for water heating, kWh/month	250.0756	220.7662	232.6938	210.6534	211.7294	202.0404	193.9151	212.9548	212.6319	218.2602	228.2955	243.8663	(219)
Water heating fuel used												2637.8827	(219)
Annual totals kWh/year													
Space heating fuel - main system												7923.6999	(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)												551.7714	(232)
Total delivered energy for all uses												11188.3539	(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	7923.6999	0.2160	1711.5192 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2637.8827	0.2160	569.7827 (264)
Space and water heating			2281.3018 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	551.7714	0.5190	286.3693 (268)
Total CO2, kg/m2/year			2606.5962 (272)
Emissions per m2 for space and water heating			13.3566 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			1.6766 (272b)
Emissions per m2 for pumps and fans			0.2279 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.3566 * 1.00) + 1.6766 + 0.2279, rounded to 2 d.p.			15.2600 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	65.4500 (1b)	x 2.4000 (2b)	= 157.0800 (1b) - (3b)
First floor	64.4100 (1c)	x 2.6900 (2c)	= 173.2629 (1c) - (3c)
Second floor	40.9400 (1d)	x 2.3900 (2d)	= 97.8466 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	170.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 428.1895 (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) = 0.0934 (8)
Pressure test					Yes
Measured/design AP50					4.7100
Infiltration rate					0.3289 (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) =				0.3289 (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	0.4194	0.4111	0.4029	0.3618	0.3536	0.3125	0.3125	0.3042	0.3289	0.3536	0.3700	0.3865 (22b)
Effective ac	0.5879	0.5845	0.5812	0.5655	0.5625	0.5488	0.5488	0.5463	0.5541	0.5625	0.5685	0.5747 (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			4.2500	1.3000	5.5250		(26)
Window (Uw = 1.40)			24.0200	1.3258	31.8447		(27)
French Door (Uw = 1.40)			5.2200	1.3258	6.9205		(27)
Roof Window (Uw = 1.80)			0.9000	1.6791	1.5112		(27a)
150mm EPS B&B			51.3600	0.1800	9.2448	75.0000	3852.0000 (28a)
140mm Timber Frame	193.8600	29.9000	163.9600	0.1900	31.1524	9.0000	1475.6400 (29a)
W2V	14.8500		14.8500	0.1400	2.0790	18.0000	267.3000 (29a)
Dormer Cheek	11.9700	3.5900	8.3800	0.3200	2.6816	18.0000	150.8400 (29a)
400mm Mineral Wool	14.7000		14.7000	0.1100	1.6170	9.0000	132.3000 (30)
Bay Flat	1.0500		1.0500	0.2500	0.2625	9.0000	9.4500 (30)
Sloping	23.4900	0.9000	22.5900	0.2000	4.5180	9.0000	203.3100 (30)
Dormer Roof	8.5000		8.5000	0.2800	2.3800	9.0000	76.5000 (30)
C2V	23.4700		23.4700	0.1400	3.2858	9.0000	211.2300 (30)
Total net area of external elements Aum(A, m ²)			343.2500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		103.0224		(33)
Timber GF			114.3800			9.0000	1029.4200 (32c)
Timber PF			133.7300			9.0000	1203.5700 (32c)
Timber 2F			56.7900			9.0000	511.1100 (32c)
Internal Floor			64.4100			18.0000	1159.3800 (32d)
Internal Floor 2			40.9400			18.0000	736.9200 (32d)
Internal Ceiling			64.4100			9.0000	579.6900 (32e)
Internal Ceiling 2			40.9400			9.0000	368.4600 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 11967.1200 (34)
Thermal mass parameter (TMP) = Cm / TFA in kJ/m²K 70.0651 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 21.9013 (36)
Total fabric heat loss (33) + (36) = 124.9237 (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	83.0767	82.5942	82.1213	79.8999	79.4843	77.5495	77.5495	77.1912	78.2948	79.4843	80.3251	81.2041 (38)
Heat transfer coeff	208.0004	207.5179	207.0450	204.8236	204.4080	202.4732	202.4732	202.1149	203.2185	204.4080	205.2488	206.1278 (39)
Average = Sum(39)m / 12 =												204.8216 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2178	1.2150	1.2122	1.1992	1.1968	1.1854	1.1854	1.1833	1.1898	1.1968	1.2017	1.2068 (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	2.9636 (42)											
Average daily hot water use (litres/day)	104.5865 (43)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	115.0452	110.8617	106.6783	102.4948	98.3113	94.1279	94.1279	98.3113	102.4948	106.6783	110.8617	115.0452 (44)
Energy content	170.6087	149.2154	153.9770	134.2409	128.8073	111.1509	102.9976	118.1913	119.6029	139.3856	152.1503	165.2254 (45)
Energy content (annual)	Total = Sum(45)m =											1645.5533 (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	36.2543	31.7083	32.7201	28.5262	27.3715	23.6196	21.8870	25.1157	25.4156	29.6194	32.3319	35.1104 (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	148.1822	148.1822	148.1822	148.1822	148.1822	148.1822	148.1822	148.1822	148.1822	148.1822	148.1822	148.1822 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	31.2436	27.7503	22.5680	17.0855	12.7716	10.7823	11.6507	15.1440	20.3262	25.8088	30.1227	32.1119 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	342.3647	345.9174	336.9648	317.9057	293.8470	271.2353	256.1292	252.5766	261.5292	280.5883	304.6469	327.2587 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.8182	37.8182	37.8182	37.8182	37.8182	37.8182	37.8182	37.8182	37.8182	37.8182	37.8182	37.8182 (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)	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457 (71)
Water heating gains (Table 5)	48.7290	47.1849	43.9786	39.6197	36.7897	32.8050	29.4180	33.7576	35.2995	39.8111	44.9055	47.1914 (72)
Total internal gains	489.7919	488.3072	470.9661	442.0655	410.8630	382.2772	364.6525	368.9328	384.6095	413.6628	447.1297	474.0166 (73)

6. Solar gains

[Jan]												Area m2	Solar flux Table 6a		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W				
Northeast														4.0200	11.2829	0.7200	0.7000	0.7700	15.8421 (75)				
Southeast														12.9100	36.7938	0.7200	0.7000	0.7700	165.9071 (77)				
Northwest														7.0900	11.2829	0.7200	0.7000	0.7700	27.9404 (81)				
Northwest														5.2200	11.2829	0.7200	0.7000	0.7700	20.5711 (81)				
Northwest														0.9000	26.0000	0.6300	0.7000	1.0000	9.2875 (82)				
Solar gains		239.5481	432.8840	656.9680	920.2748	1126.2178	1159.6362	1100.7472	941.0251	747.3381	495.9948	291.4798	202.0377 (83)										
Total gains		729.3400	921.1912	1127.9341	1362.3403	1537.0808	1541.9133	1465.3997	1309.9578	1131.9476	909.6576	738.6095	676.0543 (84)										

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000 (85)											
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	15.9817	16.0189	16.0554	16.2296	16.2626	16.4180	16.4180	16.4471	16.3578	16.2626	16.1960	16.1269
alpha	2.0654	2.0679	2.0704	2.0820	2.0842	2.0945	2.0945	2.0965	2.0905	2.0842	2.0797	2.0751
util living area	0.9683	0.9486	0.9135	0.8461	0.7443	0.6165	0.5010	0.5563	0.7455	0.8948	0.9547	0.9727 (86)
MIT	17.5679	17.9366	18.5489	19.3433	20.0530	20.5660	20.8030	20.7471	20.2995	19.3588	18.3186	17.5051 (87)
Th 2	19.9058	19.9080	19.9102	19.9206	19.9226	19.9317	19.9317	19.9333	19.9282	19.9226	19.9186	19.9145 (88)
util rest of house	0.9641	0.9419	0.9019	0.8244	0.7054	0.5512	0.4065	0.4631	0.6916	0.8754	0.9477	0.9691 (89)
MIT	16.7522	17.1184	17.7234	18.5032	19.1764	19.6431	19.8326	19.7981	19.4244	18.5348	17.5079	16.6953 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	16.8347	17.2011	17.8068	18.5882	19.2651	19.7364	19.9307	19.8941	19.5129	18.6181	17.5898	16.7772 (92)
Temperature adjustment	0.0000											
adjusted MIT	16.8347	17.2011	17.8068	18.5882	19.2651	19.7364	19.9307	19.8941	19.5129	18.6181	17.5898	16.7772 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9471	0.9188	0.8721	0.7912	0.6778	0.5379	0.4064	0.4593	0.6667	0.8442	0.9263	0.9538 (94)
Useful gains	690.7430	846.3662	983.7240	1077.9351	1041.8250	829.3305	595.6003	601.6492	754.6668	767.9366	684.1549	644.8334 (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	2607.2174	2552.7018	2341.0242	1984.3646	1546.3568	1039.9824	674.3767	706.2090	1099.9997	1638.9681	2153.0276	2592.5143 (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	1425.8570	1146.6576	1009.8313	652.6292	375.3717	0.0000	0.0000	0.0000	0.0000	648.0475	1057.5883	1449.0745 (98)
Space heating												7765.0571 (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) = 45.4629 (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	1903.2484	1498.3019	1536.0736	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6803	0.7418	0.7017	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1294.8380	1111.4269	1077.9227	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1922.9651	1831.0348	1654.0469	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	452.2515	535.3883	428.6364	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling													
Cooled fraction													1416.2762 (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	113.0629	133.8471	107.1591	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling													354.0690 (107)
Space cooling per m2													2.0730 (108)
Energy for space heating													45.4629 (99)
Energy for space cooling													2.0730 (108)
Total													47.5359 (109)
Dwelling Fabric Energy Efficiency (DFEE)													47.5 (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	65.4500 (1b)	x 2.4000 (2b)	= 157.0800 (1b) - (3b)
First floor	64.4100 (1c)	x 2.6900 (2c)	= 173.2629 (1c) - (3c)
Second floor	40.9400 (1d)	x 2.3900 (2d)	= 97.8466 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	170.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 428.1895 (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) = 0.0934 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3434 (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) =				0.3434 (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	0.4379	0.4293	0.4207	0.3778	0.3692	0.3262	0.3262	0.3177	0.3434	0.3692	0.3863	0.4035 (22b)
Effective ac	0.5959	0.5921	0.5885	0.5714	0.5681	0.5532	0.5532	0.5505	0.5590	0.5681	0.5746	0.5814 (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			4.2500	1.0000	4.2500		(26)
TER Opening Type (Uw = 1.40)			29.2400	1.3258	38.7652		(27)
TER Room Window (Uw = 1.70)			0.9000	1.5918	1.4326		(27a)
150mm EPS B&B			51.3600	0.1300	6.6768		(28a)
140mm Timber Frame	193.8600	29.9000	163.9600	0.1800	29.5128		(29a)
W2V	14.8500		14.8500	0.1800	2.6730		(29a)
Dormer Cheek	11.9700	3.5900	8.3800	0.1800	1.5084		(29a)
400mm Mineral Wool	14.7000		14.7000	0.1300	1.9110		(30)
Bay Flat	1.0500		1.0500	0.1300	0.1365		(30)
Sloping	23.4900	0.9000	22.5900	0.1300	2.9367		(30)
Dormer Roof	8.5000		8.5000	0.1300	1.1050		(30)
C2V	23.4700		23.4700	0.1300	3.0511		(30)
Total net area of external elements Aum(A, m ²)			343.2500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		93.9590		(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)							17.4975 (36)
Total fabric heat loss						(33) + (36) =	111.4565 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 84.1964	Feb 83.6704	Mar 83.1549	Apr 80.7333	May 80.2802	Jun 78.1711	Jul 78.1711	Aug 77.7806	Sep 78.9835	Oct 80.2802	Nov 81.1968	Dec 82.1550 (38)
Heat transfer coeff	195.6529	195.1269	194.6114	192.1898	191.7368	189.6277	189.6277	189.2371	190.4401	191.7368	192.6533	193.6115 (39)
Average = Sum(39)m / 12 =												192.1877 (39)
HLP	Jan 1.1455	Feb 1.1424	Mar 1.1394	Apr 1.1252	May 1.1226	Jun 1.1102	Jul 1.1102	Aug 1.1079	Sep 1.1150	Oct 1.1226	Nov 1.1279	Dec 1.1336 (40)
HLP (average)												1.1252 (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												2.9636 (42)
Average daily hot water use (litres/day)												104.5865 (43)
Daily hot water use	Jan 115.0452	Feb 110.8617	Mar 106.6783	Apr 102.4948	May 98.3113	Jun 94.1279	Jul 94.1279	Aug 98.3113	Sep 102.4948	Oct 106.6783	Nov 110.8617	Dec 115.0452 (44)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Energy conte	170.6087	149.2154	153.9770	134.2409	128.8073	111.1509	102.9976	118.1913	119.6029	139.3856	152.1503	165.2254 (45)
Energy content (annual)										Total =	Sum (45)m =	1645.5533 (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	36.2543	31.7083	32.7201	28.5262	27.3715	23.6196	21.8870	25.1157	25.4156	29.6194	32.3319	35.1104 (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	148.1822	148.1822	148.1822	148.1822	148.1822	148.1822	148.1822	148.1822	148.1822	148.1822	148.1822	148.1822 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	31.2436	27.7503	22.5680	17.0855	12.7716	10.7823	11.6507	15.1440	20.3262	25.8088	30.1227	32.1119 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	342.3647	345.9174	336.9648	317.9057	293.8470	271.2353	256.1292	252.5766	261.5292	280.5883	304.6469	327.2587 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.8182	37.8182	37.8182	37.8182	37.8182	37.8182	37.8182	37.8182	37.8182	37.8182	37.8182	37.8182 (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)	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457 (71)
Water heating gains (Table 5)	48.7290	47.1849	43.9786	39.6197	36.7897	32.8050	29.4180	33.7576	35.2995	39.8111	44.9055	47.1914 (72)
Total internal gains	489.7919	488.3072	470.9661	442.0655	410.8630	382.2772	364.6525	368.9328	384.6095	413.6628	447.1297	474.0166 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d	Gains W	
Northeast				4.0200	11.2829		0.6300		0.7000	0.7700	13.8618 (75)	
Southeast				12.9100	36.7938		0.6300		0.7000	0.7700	145.1687 (77)	
Northwest				12.3100	11.2829		0.6300		0.7000	0.7700	42.4475 (81)	
Northwest				0.9000	26.0000		0.6300		0.7000	1.0000	9.2875 (82)	
Solar gains	210.7655	381.1847	579.1335	811.9382	994.0137	1023.6119	971.5929	830.4072	659.0558	436.9424	256.5183	177.7206 (83)
Total gains	700.5574	869.4919	1050.0996	1254.0036	1404.8766	1405.8891	1336.2454	1199.3400	1043.6653	850.6052	703.6480	651.7373 (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	60.6232	60.7866	60.9477	61.7156	61.8614	62.5495	62.5495	62.6786	62.2826	61.8614	61.5671	61.2624
alpha	5.0415	5.0524	5.0632	5.1144	5.1241	5.1700	5.1700	5.1786	5.1522	5.1241	5.1045	5.0842
util living area	0.9997	0.9989	0.9958	0.9800	0.9186	0.7707	0.6027	0.6819	0.9171	0.9927	0.9992	0.9998 (86)
MIT	19.5873	19.7484	20.0215	20.3943	20.7277	20.9279	20.9839	20.9708	20.8025	20.3647	19.9098	19.5655 (87)
Th 2	19.9638	19.9663	19.9688	19.9803	19.9824	19.9925	19.9925	19.9943	19.9886	19.9824	19.9781	19.9735 (88)
util rest of house	0.9995	0.9985	0.9941	0.9715	0.8834	0.6829	0.4757	0.5537	0.8660	0.9885	0.9988	0.9997 (89)
MIT 2	18.6627	18.8256	19.0998	19.4769	19.7907	19.9578	19.9882	19.9854	19.8682	19.4530	18.9964	18.6486 (90)
Living area fraction									fLA = Living area / (4) =			0.1011 (91)
MIT	18.7562	18.9189	19.1930	19.5697	19.8854	20.0559	20.0889	20.0851	19.9627	19.5451	19.0887	18.7413 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7562	18.9189	19.1930	19.5697	19.8854	20.0559	20.0889	20.0851	19.9627	19.5451	19.0887	18.7413 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9993	0.9979	0.9924	0.9670	0.8793	0.6890	0.4884	0.5662	0.8643	0.9859	0.9984	0.9995 (94)
Useful gains	700.0937	867.6780	1042.1147	1212.5719	1235.3394	968.6838	652.6554	679.1036	902.0707	838.6502	702.5131	651.4428 (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	2828.3902	2735.4742	2470.2084	2050.6057	1569.4482	1034.5965	661.5911	697.3512	1116.4841	1715.1139	2309.6710	2815.3599 (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	1583.4526	1255.1591	1062.5017	603.3844	248.5769	0.0000	0.0000	0.0000	0.0000	652.0890	1157.1537	1609.9543 (98)
Space heating												8172.2716 (98)
Space heating per m2										(98) / (4) =		47.8470 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1782.5000	1403.2447	1438.2019	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8335	0.9032	0.8616	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1485.7426	1267.3518	1239.1705	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1763.9757	1680.0753	1524.7532	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	200.3278	307.0662	212.4736	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												719.8676	(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	50.0820	76.7666	53.1184	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling												179.9669	(107)
Space cooling per m2												1.0537	(108)
Energy for space heating												47.8470	(99)
Energy for space cooling												1.0537	(108)
Total												48.9007	(109)
Target Fabric Energy Efficiency (TFEE)												56.2	(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	65.4500 (1b)	x 2.4000 (2b)	= 157.0800 (1b) - (3b)
First floor	64.4100 (1c)	x 2.6900 (2c)	= 173.2629 (1c) - (3c)
Second floor	40.9400 (1d)	x 2.3900 (2d)	= 97.8466 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	170.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 428.1895 (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											4.7100	
Infiltration rate											0.2355	(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) =	0.2355 (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)
	0.2591	0.2414	0.2414	0.2296	0.2296	0.2178	0.2178	0.2061	0.2061	0.2237	0.2178	0.2296 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5091	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
Solid Door			4.2500	1.3000	5.5250			(26)					
Window (Uw = 1.40)			24.0200	1.3258	31.8447			(27)					
French Door (Uw = 1.40)			5.2200	1.3258	6.9205			(27)					
Roof Window (Uw = 1.80)			0.9000	1.6791	1.5112			(27a)					
150mm EPS B&B			51.3600	0.1800	9.2448	75.0000	3852.0000	(28a)					
140mm Timber Frame	193.8600	29.9000	163.9600	0.1900	31.1524	9.0000	1475.6400	(29a)					
W2V	14.8500		14.8500	0.1400	2.0790	18.0000	267.3000	(29a)					
Dormer Cheek	11.9700	3.5900	8.3800	0.3200	2.6816	18.0000	150.8400	(29a)					
400mm Mineral Wool	14.7000		14.7000	0.1100	1.6170	9.0000	132.3000	(30)					
Bay Flat	1.0500		1.0500	0.2500	0.2625	9.0000	9.4500	(30)					
Sloping	23.4900	0.9000	22.5900	0.2000	4.5180	9.0000	203.3100	(30)					
Dormer Roof	8.5000		8.5000	0.2800	2.3800	9.0000	76.5000	(30)					
C2V	23.4700		23.4700	0.1400	3.2858	9.0000	211.2300	(30)					
Total net area of external elements Aum(A, m2)			343.2500					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	103.0224			(33)					
Timber GF			114.3800			9.0000	1029.4200	(32c)					
Timber FF			133.7300			9.0000	1203.5700	(32c)					
Timber 2F			56.7900			9.0000	511.1100	(32c)					
Internal Floor			64.4100			18.0000	1159.3800	(32d)					
Internal Floor 2			40.9400			18.0000	736.9200	(32d)					
Internal Ceiling			64.4100			18.0000	1159.3800	(32e)					
Internal Ceiling 2			40.9400			18.0000	736.9200	(32e)					
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		12915.2700	(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							75.6163	(35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							21.9013	(36)					
Total fabric heat loss						(33) + (36) =	124.9237	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 71.9301	Feb 70.6513	Mar 70.6513	Apr 70.6513	May 70.6513	Jun 70.6513	Jul 70.6513	Aug 70.6513	Sep 70.6513	Oct 70.6513	Nov 70.6513	Dec 70.6513	(38)
Heat transfer coeff	196.8538	195.5750	195.5750	195.5750	195.5750	195.5750	195.5750	195.5750	195.5750	195.5750	195.5750	195.5750	(39)
Average = Sum(39)m / 12 =												195.6815	(39)
HLP	Jan 1.1525	Feb 1.1451	Mar 1.1451	Apr 1.1451	May 1.1451	Jun 1.1451	Jul 1.1451	Aug 1.1451	Sep 1.1451	Oct 1.1451	Nov 1.1451	Dec 1.1451	(40)
HLP (average)												1.1457	(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	2.9636 (42)											
Average daily hot water use (litres/day)	104.5865 (43)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	115.0452	110.8617	106.6783	102.4948	98.3113	94.1279	94.1279	98.3113	102.4948	106.6783	110.8617	115.0452 (44)
Energy content (annual)	170.6087	149.2154	153.9770	134.2409	128.8073	111.1509	102.9976	118.1913	119.6029	139.3856	152.1503	165.2254 (45)
Distribution loss (46)m = 0.15 x (45)m	25.5913	22.3823	23.0965	20.1361	19.3211	16.6726	15.4496	17.7287	17.9404	20.9078	22.8225	24.7838 (46)
Water storage loss:												
Store volume												210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.4200 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7668 (55)
Total storage loss	23.7708	21.4704	23.7708	23.0040	23.7708	23.0040	23.7708	23.7708	23.0040	23.7708	23.0040	23.7708 (56)
If cylinder contains dedicated solar storage	23.7708	21.4704	23.7708	23.0040	23.7708	23.0040	23.7708	23.7708	23.0040	23.7708	23.0040	23.7708 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	217.6419	191.6970	201.0102	179.7569	175.8405	156.6669	150.0308	165.2245	165.1189	186.4188	197.6663	212.2586 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	217.6419	191.6970	201.0102	179.7569	175.8405	156.6669	150.0308	165.2245	165.1189	186.4188	197.6663	212.2586 (64)
RHI water heating demand												2199.3313 (64)
Heat gains from water heating, kWh/month	94.3539	83.5994	88.8239	81.0479	80.4550	73.3705	71.8733	76.9252	76.1808	83.9723	87.0028	92.5640 (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	177.8186	177.8186	177.8186	177.8186	177.8186	177.8186	177.8186	177.8186	177.8186	177.8186	177.8186	177.8186 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	78.1089	69.3757	56.4201	42.7136	31.9289	26.9558	29.1267	37.8599	50.8155	64.5220	75.3067	80.2798 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	510.9921	516.2946	502.9325	474.4861	438.5776	404.8288	382.2824	376.9799	390.3421	418.7884	454.6969	488.4458 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.7455	55.7455	55.7455	55.7455	55.7455	55.7455	55.7455	55.7455	55.7455	55.7455	55.7455	55.7455 (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)	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457 (71)
Water heating gains (Table 5)	126.8198	124.4039	119.3870	112.5665	108.1384	101.9034	96.6039	103.3940	105.8066	112.8660	120.8372	124.4140 (72)
Total internal gains	833.9392	828.0925	796.7579	747.7846	696.6634	651.7063	626.0313	636.2523	664.9825	714.1947	768.8591	811.1580 (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				4.0200	14.6176	0.7200	0.7000	0.7700	20.5243 (75)			
Southeast				12.9100	45.1778	0.7200	0.7000	0.7700	203.7114 (77)			
Northwest				7.0900	14.6176	0.7200	0.7000	0.7700	36.1982 (81)			
Northwest				5.2200	14.6176	0.7200	0.7000	0.7700	26.6509 (81)			
Northwest				0.9000	34.0000	0.6300	0.7000	1.0000	12.1451 (82)			
Solar gains	299.2299	462.0761	711.4833	1008.6467	1170.3322	1321.8849	1210.3581	1078.1156	850.7124	565.3147	363.3114	238.6599 (83)
Total gains	1133.1692	1290.1686	1508.2412	1756.4313	1866.9956	1973.5912	1836.3894	1714.3678	1515.6950	1279.5094	1132.1705	1049.8178 (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	18.2246	18.3437	18.3437	18.3437	18.3437	18.3437	18.3437	18.3437	18.3437	18.3437	18.3437	18.3437
alpha	2.2150	2.2229	2.2229	2.2229	2.2229	2.2229	2.2229	2.2229	2.2229	2.2229	2.2229	2.2229
util living area	0.9277	0.9040	0.8505	0.7563	0.6224	0.4437	0.3284	0.3485	0.5791	0.7907	0.8955	0.9360 (86)
MIT	18.5269	18.8052	19.3566	19.9892	20.5295	20.8505	20.9479	20.9411	20.7089	20.0807	19.2186	18.4836 (87)
Th 2	19.9582	19.9642	19.9642	19.9642	19.9642	19.9642	19.9642	19.9642	19.9642	19.9642	19.9642	19.9642 (88)
util rest of house	0.9184	0.8919	0.8314	0.7247	0.5708	0.3691	0.2333	0.2487	0.5056	0.7544	0.8798	0.9276 (89)
MIT 2	16.6893	17.0894	17.8724	18.7499	19.4668	19.8449	19.9384	19.9347	19.7021	18.8998	17.6902	16.6310 (90)
Living area fraction	16.8751	17.2629	18.0225	18.8752	19.5743	19.9466	20.0405	20.0365	19.8039	19.0192	17.8447	16.8183 (92)
MIT	16.8751	17.2629	18.0225	18.8752	19.5743	19.9466	20.0405	20.0365	19.8039	19.0192	17.8447	16.8183 (92)
Temperature adjustment	16.7251	17.1129	17.8725	18.7252	19.4243	19.7966	19.8905	19.8865	19.6539	18.8692	17.6947	16.6683 (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	0.8761	0.8454	0.7815	0.6797	0.5406	0.3561	0.2262	0.2408	0.4808	0.7064	0.8318	0.8875	(94)
Useful gains	992.7625	1090.7565	1178.6547	1193.8537	1009.3744	702.8942	415.3557	412.7981	728.8197	903.7988	941.7112	931.7036	(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	2229.3864	2192.9653	2009.0395	1706.4256	1236.8742	762.0678	428.3976	427.6199	851.5134	1343.4468	1817.8152	2184.2408	(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	920.0482	740.6843	617.8063	369.0518	169.2598	0.0000	0.0000	0.0000	0.0000	327.0981	630.7948	931.8877	(98)
Space heating												4706.6311	(98)
RHI space heating demand												4707	(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	65.4500 (1b)	x 2.4000 (2b)	= 157.0800 (1b) - (3b)
First floor	64.4100 (1c)	x 2.6900 (2c)	= 173.2629 (1c) - (3c)
Second floor	40.9400 (1d)	x 2.3900 (2d)	= 97.8466 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	170.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 428.1895 (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					4.7100
Infiltration rate					0.2355 (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) =				0.2355 (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	0.3003	0.2944	0.2885	0.2591	0.2532	0.2237	0.2237	0.2178	0.2355	0.2532	0.2649	0.2767 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												
Effective ac	0.5503	0.5444	0.5385	0.5091	0.5032	0.5000	0.5000	0.5000	0.5000	0.5032	0.5149	0.5267 (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			4.2500	1.3000	5.5250		(26)
Window (Uw = 1.40)			24.0200	1.3258	31.8447		(27)
French Door (Uw = 1.40)			5.2200	1.3258	6.9205		(27)
Roof Window (Uw = 1.80)			0.9000	1.6791	1.5112		(27a)
150mm EPS B&B			51.3600	0.1800	9.2448	75.0000	3852.0000 (28a)
140mm Timber Frame	193.8600	29.9000	163.9600	0.1900	31.1524	9.0000	1475.6400 (29a)
W2V	14.8500		14.8500	0.1400	2.0790	18.0000	267.3000 (29a)
Dormer Cheek	11.9700	3.5900	8.3800	0.3200	2.6816	18.0000	150.8400 (29a)
400mm Mineral Wool	14.7000		14.7000	0.1100	1.6170	9.0000	132.3000 (30)
Bay Flat	1.0500		1.0500	0.2500	0.2625	9.0000	9.4500 (30)
Sloping	23.4900	0.9000	22.5900	0.2000	4.5180	9.0000	203.3100 (30)
Dormer Roof	8.5000		8.5000	0.2800	2.3800	9.0000	76.5000 (30)
C2V	23.4700		23.4700	0.1400	3.2858	9.0000	211.2300 (30)
Total net area of external elements Aum(A, m ²)			343.2500				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	103.0224	(33)
Timber GF						9.0000	1029.4200 (32c)
Timber FF						9.0000	1203.5700 (32c)
Timber 2F						9.0000	511.1100 (32c)
Internal Floor						18.0000	1159.3800 (32d)
Internal Floor 2						18.0000	736.9200 (32d)
Internal Ceiling						18.0000	1159.3800 (32e)
Internal Ceiling 2						18.0000	736.9200 (32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		12915.2700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							75.6163 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							21.9013 (36)
Total fabric heat loss					(33) + (36) =		124.9237 (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	77.7535	76.9216	76.0896	71.9301	71.0981	70.6513	70.6513	70.6513	70.6513	71.0981	72.7620	74.4258 (38)
Heat transfer coeff	202.6772	201.8453	201.0134	196.8538	196.0219	195.5750	195.5750	195.5750	195.5750	196.0219	197.6857	199.3495 (39)
Average = Sum(39)m / 12 =												197.8140 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1866	1.1818	1.1769	1.1525	1.1477	1.1451	1.1451	1.1451	1.1451	1.1477	1.1574	1.1672 (40)
HLP (average)												1.1582 (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	2.9636 (42)											
Average daily hot water use (litres/day)	104.5865 (43)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	115.0452	110.8617	106.6783	102.4948	98.3113	94.1279	94.1279	98.3113	102.4948	106.6783	110.8617	115.0452 (44)
Energy content (annual)	170.6087	149.2154	153.9770	134.2409	128.8073	111.1509	102.9976	118.1913	119.6029	139.3856	152.1503	165.2254 (45)
Distribution loss (46)m = 0.15 x (45)m	25.5913											
Water 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)
Store volume	210.0000 (47)											
a) If manufacturer declared loss factor is known (kWh/day):	1.4200 (48)											
Temperature factor from Table 2b	0.5400 (49)											
Enter (49) or (54) in (55)	0.7668 (55)											
Total storage loss	23.7708	21.4704	23.7708	23.0040	23.7708	23.0040	23.7708	23.7708	23.0040	23.7708	23.0040	23.7708 (56)
If cylinder contains dedicated solar storage	23.7708	21.4704	23.7708	23.0040	23.7708	23.0040	23.7708	23.7708	23.0040	23.7708	23.0040	23.7708 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	217.6419	191.6970	201.0102	179.7569	175.8405	156.6669	150.0308	165.2245	165.1189	186.4188	197.6663	212.2586 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	217.6419	191.6970	201.0102	179.7569	175.8405	156.6669	150.0308	165.2245	165.1189	186.4188	197.6663	212.2586 (64)
Heat gains from water heating, kWh/month	94.3539	83.5994	88.8239	81.0479	80.4550	73.3705	71.8733	76.9252	76.1808	83.9723	87.0028	92.5640 (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	177.8186	177.8186	177.8186	177.8186	177.8186	177.8186	177.8186	177.8186	177.8186	177.8186	177.8186	177.8186 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	78.1089	69.3757	56.4201	42.7136	31.9289	26.9558	29.1267	37.8599	50.8155	64.5220	75.3067	80.2798 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	510.9921	516.2946	502.9325	474.4861	438.5776	404.8288	382.2824	376.9799	390.3421	418.7884	454.6969	488.4458 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.7455	55.7455	55.7455	55.7455	55.7455	55.7455	55.7455	55.7455	55.7455	55.7455	55.7455	55.7455 (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)	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457 (71)
Water heating gains (Table 5)	126.8198	124.4039	119.3870	112.5665	108.1384	101.9034	96.6039	103.3940	105.8066	112.8660	120.8372	124.4140 (72)
Total internal gains	833.9392	828.0925	796.7579	747.7846	696.6634	651.7063	626.0313	636.2523	664.9825	714.1947	768.8591	811.1580 (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				4.0200	11.2829	0.7200	0.7000		0.7700	15.8421 (75)		
Southeast				12.9100	36.7938	0.7200	0.7000		0.7700	165.9071 (77)		
Northwest				7.0900	11.2829	0.7200	0.7000		0.7700	27.9404 (81)		
Northwest				5.2200	11.2829	0.7200	0.7000		0.7700	20.5711 (81)		
Northwest				0.9000	26.0000	0.6300	0.7000		1.0000	9.2875 (82)		
Solar gains	239.5481	432.8840	656.9680	920.2748	1126.2178	1159.6362	1100.7472	941.0251	747.3381	495.9948	291.4798	202.0377 (83)
Total gains	1073.4873	1260.9765	1453.7259	1668.0594	1822.8812	1811.3425	1726.7785	1577.2773	1412.3207	1210.1895	1060.3389	1013.1956 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)	21.0000 (85)											
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	17.7009	17.7739	17.8474	18.2246	18.3019	18.3437	18.3437	18.3437	18.3437	18.3019	18.1479	17.9964
alpha	2.1801	2.1849	2.1898	2.2150	2.2201	2.2229	2.2229	2.2229	2.2229	2.2201	2.2099	2.1998
util living area	0.9427	0.9187	0.8774	0.8003	0.6895	0.5561	0.4389	0.4863	0.6739	0.8431	0.9214	0.9486 (86)
MIT	18.1341	18.4691	19.0124	19.7180	20.3053	20.6999	20.8739	20.8370	20.5115	19.7505	18.8358	18.0931 (87)
Th 2	19.9307	19.9346	19.9385	19.9582	19.9621	19.9642	19.9642	19.9642	19.9642	19.9621	19.9542	19.9464 (88)
util rest of house	0.9355	0.9086	0.8620	0.7746	0.6478	0.4918	0.3521	0.3987	0.6155	0.8170	0.9101	0.9422 (89)
MIT 2	16.1116	16.5937	17.3716	18.3736	19.1748	19.6797	19.8745	19.8416	19.4654	18.4428	17.1372	16.0584 (90)
Living area fraction	16.3161	16.7833	17.5375	18.5095	19.2891	19.7828	19.9756	19.9422	19.5711	18.5751	17.3090	16.2641 (92)
Temperature adjustment	16.1661	16.6333	17.3875	18.3595	19.1391	19.6328	19.8256	19.7922	19.4211	18.4251	17.1590	16.1141 (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	0.8967	0.8637	0.8119	0.7259	0.6098	0.4690	0.3396	0.3828	0.5798	0.7664	0.8659	0.9058	(94)
Useful gains	962.5518	1089.1416	1180.3148	1210.9179	1111.5324	849.5854	586.4187	603.7055	818.8765	927.5471	918.1110	917.7638	(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	2404.9852	2368.3170	2188.5307	1862.1426	1458.2208	984.2928	630.8418	663.4368	1040.6816	1533.8815	1988.5197	2375.0707	(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	1073.1705	859.6059	750.1126	468.8818	257.9361	0.0000	0.0000	0.0000	0.0000	451.1128	770.6943	1084.2364	(98)
Space heating												5715.7503	(98)
Space heating per m2											(98) / (4) =	33.4646	(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													6308.7752	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	1073.1705	859.6059	750.1126	468.8818	257.9361	0.0000	0.0000	0.0000	0.0000	451.1128	770.6943	1084.2364	(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)	1184.5149	948.7923	827.9389	517.5296	284.6977	0.0000	0.0000	0.0000	0.0000	497.9170	850.6559	1196.7289	(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	217.6419	191.6970	201.0102	179.7569	175.8405	156.6669	150.0308	165.2245	165.1189	186.4188	197.6663	212.2586	(64)	
Efficiency of water heater	88.5995	88.4404	88.1064	87.3579	85.9349	79.9000	79.9000	79.9000	79.9000	87.1859	88.1893	88.6562	(217)	
Fuel for water heating, kWh/month	245.6470	216.7528	228.1448	205.7705	204.6205	196.0787	187.7733	206.7891	206.6569	213.8175	224.1387	239.4175	(219)	
Water heating fuel used												2575.6074	(219)	
Annual totals kWh/year														
Space heating fuel - main system												6308.7752	(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)													120.5738	(230a)
central heating pump													30.0000	(230c)
main heating flue fan													45.0000	(230e)
Total electricity for the above, kWh/year													195.5738	(231)
Electricity for lighting (calculated in Appendix L)													551.7714	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 0.96 * 853 * 1.00) =										-655.1270		-655.1270	(233)	
Total delivered energy for all uses												8976.6009	(238)	

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	6308.7752	3.4800	219.5454	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	2575.6074	3.4800	89.6311	(247)
Mechanical ventilation fans	120.5738	13.1900	15.9037	(249)
Pumps and fans for heating	75.0000	13.1900	9.8925	(249)
Energy for lighting	551.7714	13.1900	72.7786	(250)
Additional standing charges			120.0000	(251)
Energy saving/generation technologies				
PV Unit	-655.1270	13.1900	-86.4112	(252)
Total energy cost			441.3401	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):			0.4200	(256)
Energy cost factor (ECF)		[(255) x (256)] / [(4) + 45.0] =	0.8590	(257)
SAP value			88.0176	
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	6308.7752	0.2160	1362.6954 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2575.6074	0.2160	556.3312 (264)
Space and water heating			1919.0267 (265)
Pumps and fans	195.5738	0.5190	101.5028 (267)
Energy for lighting	551.7714	0.5190	286.3693 (268)
Energy saving/generation technologies			
PV Unit	-655.1270	0.5190	-340.0109 (269)
Total kg/year			1966.8879 (272)
CO2 emissions per m2			11.5200 (273)
EI value			87.7867
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	$3.48 / 0.8517 = 4.086$, stars = 4
Water heating environmental impact	$0.216 / 0.8517 = 0.2536$, 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	65.4500 (1b)	x 2.4000 (2b)	= 157.0800 (1b) - (3b)
First floor	64.4100 (1c)	x 2.6900 (2c)	= 173.2629 (1c) - (3c)
Second floor	40.9400 (1d)	x 2.3900 (2d)	= 97.8466 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	170.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 428.1895 (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											4.7100	
Infiltration rate											0.2355 (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) =	0.2355 (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)
	0.2591	0.2414	0.2414	0.2296	0.2296	0.2178	0.2178	0.2061	0.2061	0.2237	0.2178	0.2296 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5091	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Solid Door			4.2500	1.3000	5.5250			(26)				
Window (Uw = 1.40)			24.0200	1.3258	31.8447			(27)				
French Door (Uw = 1.40)			5.2200	1.3258	6.9205			(27)				
Roof Window (Uw = 1.80)			0.9000	1.6791	1.5112			(27a)				
150mm EPS B&B			51.3600	0.1800	9.2448	75.0000	3852.0000	(28a)				
140mm Timber Frame	193.8600	29.9000	163.9600	0.1900	31.1524	9.0000	1475.6400	(29a)				
W2V	14.8500		14.8500	0.1400	2.0790	18.0000	267.3000	(29a)				
Dormer Cheek	11.9700	3.5900	8.3800	0.3200	2.6816	18.0000	150.8400	(29a)				
400mm Mineral Wool	14.7000		14.7000	0.1100	1.6170	9.0000	132.3000	(30)				
Bay Flat	1.0500		1.0500	0.2500	0.2625	9.0000	9.4500	(30)				
Sloping	23.4900	0.9000	22.5900	0.2000	4.5180	9.0000	203.3100	(30)				
Dormer Roof	8.5000		8.5000	0.2800	2.3800	9.0000	76.5000	(30)				
C2V	23.4700		23.4700	0.1400	3.2858	9.0000	211.2300	(30)				
Total net area of external elements Aum(A, m2)			343.2500					(31)				
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	103.0224			(33)				
Timber GF			114.3800			9.0000	1029.4200	(32c)				
Timber FF			133.7300			9.0000	1203.5700	(32c)				
Timber 2F			56.7900			9.0000	511.1100	(32c)				
Internal Floor			64.4100			18.0000	1159.3800	(32d)				
Internal Floor 2			40.9400			18.0000	736.9200	(32d)				
Internal Ceiling			64.4100			18.0000	1159.3800	(32e)				
Internal Ceiling 2			40.9400			18.0000	736.9200	(32e)				
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =				12915.2700 (34)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								75.6163 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								21.9013 (36)				
Total fabric heat loss				(33) + (36) =				124.9237 (37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 71.9301	Feb 70.6513	Mar 70.6513	Apr 70.6513	May 70.6513	Jun 70.6513	Jul 70.6513	Aug 70.6513	Sep 70.6513	Oct 70.6513	Nov 70.6513	Dec 70.6513 (38)
Heat transfer coeff	196.8538	195.5750	195.5750	195.5750	195.5750	195.5750	195.5750	195.5750	195.5750	195.5750	195.5750	195.5750 (39)
Average = Sum(39)m / 12 =												195.6815 (39)
HLP	Jan 1.1525	Feb 1.1451	Mar 1.1451	Apr 1.1451	May 1.1451	Jun 1.1451	Jul 1.1451	Aug 1.1451	Sep 1.1451	Oct 1.1451	Nov 1.1451	Dec 1.1451 (40)
HLP (average)												1.1457 (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	2.9636 (42)											
Average daily hot water use (litres/day)	104.5865 (43)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	115.0452	110.8617	106.6783	102.4948	98.3113	94.1279	94.1279	98.3113	102.4948	106.6783	110.8617	115.0452 (44)
Energy content (annual)	170.6087	149.2154	153.9770	134.2409	128.8073	111.1509	102.9976	118.1913	119.6029	139.3856	152.1503	165.2254 (45)
Distribution loss (46)m = 0.15 x (45)m	25.5913											
Water storage loss:	25.5913	22.3823	23.0965	20.1361	19.3211	16.6726	15.4496	17.7287	17.9404	20.9078	22.8225	24.7838 (46)
Store volume	210.0000 (47)											
a) If manufacturer declared loss factor is known (kWh/day):	1.4200 (48)											
Temperature factor from Table 2b	0.5400 (49)											
Enter (49) or (54) in (55)	0.7668 (55)											
Total storage loss	23.7708	21.4704	23.7708	23.0040	23.7708	23.0040	23.7708	23.7708	23.0040	23.7708	23.0040	23.7708 (56)
If cylinder contains dedicated solar storage	23.7708	21.4704	23.7708	23.0040	23.7708	23.0040	23.7708	23.7708	23.0040	23.7708	23.0040	23.7708 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	217.6419	191.6970	201.0102	179.7569	175.8405	156.6669	150.0308	165.2245	165.1189	186.4188	197.6663	212.2586 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	217.6419	191.6970	201.0102	179.7569	175.8405	156.6669	150.0308	165.2245	165.1189	186.4188	197.6663	212.2586 (64)
Heat gains from water heating, kWh/month	94.3539	83.5994	88.8239	81.0479	80.4550	73.3705	71.8733	76.9252	76.1808	83.9723	87.0028	92.5640 (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	177.8186	177.8186	177.8186	177.8186	177.8186	177.8186	177.8186	177.8186	177.8186	177.8186	177.8186	177.8186 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	78.1089	69.3757	56.4201	42.7136	31.9289	26.9558	29.1267	37.8599	50.8155	64.5220	75.3067	80.2798 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	510.9921	516.2946	502.9325	474.4861	438.5776	404.8288	382.2824	376.9799	390.3421	418.7884	454.6969	488.4458 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.7455	55.7455	55.7455	55.7455	55.7455	55.7455	55.7455	55.7455	55.7455	55.7455	55.7455	55.7455 (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)	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457 (71)
Water heating gains (Table 5)	126.8198	124.4039	119.3870	112.5665	108.1384	101.9034	96.6039	103.3940	105.8066	112.8660	120.8372	124.4140 (72)
Total internal gains	833.9392	828.0925	796.7579	747.7846	696.6634	651.7063	626.0313	636.2523	664.9825	714.1947	768.8591	811.1580 (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				4.0200	14.6176		0.7200		0.7000		0.7700		20.5243 (75)
Southeast				12.9100	45.1778		0.7200		0.7000		0.7700		203.7114 (77)
Northwest				7.0900	14.6176		0.7200		0.7000		0.7700		36.1982 (81)
Northwest				5.2200	14.6176		0.7200		0.7000		0.7700		26.6509 (81)
Northwest				0.9000	34.0000		0.6300		0.7000		1.0000		12.1451 (82)
Solar gains	299.2299	462.0761	711.4833	1008.6467	1170.3322	1321.8849	1210.3581	1078.1156	850.7124	565.3147	363.3114	238.6599	(83)
Total gains	1133.1692	1290.1686	1508.2412	1756.4313	1866.9956	1973.5912	1836.3894	1714.3678	1515.6950	1279.5094	1132.1705	1049.8178	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)	21.0000 (85)											
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	18.2246	18.3437	18.3437	18.3437	18.3437	18.3437	18.3437	18.3437	18.3437	18.3437	18.3437	18.3437
alpha	2.2150	2.2229	2.2229	2.2229	2.2229	2.2229	2.2229	2.2229	2.2229	2.2229	2.2229	2.2229
util living area	0.9277	0.9040	0.8505	0.7563	0.6224	0.4437	0.3284	0.3485	0.5791	0.7907	0.8955	0.9360 (86)
MIT	18.5269	18.8052	19.3566	19.9892	20.5295	20.8505	20.9479	20.9411	20.7089	20.0807	19.2186	18.4836 (87)
Th 2	19.9582	19.9642	19.9642	19.9642	19.9642	19.9642	19.9642	19.9642	19.9642	19.9642	19.9642	19.9642 (88)
util rest of house	0.9184	0.8919	0.8314	0.7247	0.5708	0.3691	0.2333	0.2487	0.5056	0.7544	0.8798	0.9276 (89)
MIT 2	16.6893	17.0894	17.8724	18.7499	19.4668	19.8449	19.9384	19.9347	19.7021	18.8998	17.6902	16.6310 (90)
Living area fraction	16.8751	17.2629	18.0225	18.8752	19.5743	19.9466	20.0405	20.0365	19.8039	19.0192	17.8447	16.8183 (92)
Temperature adjustment	16.7251	17.1129	17.8725	18.7252	19.4243	19.7966	19.8905	19.8865	19.6539	18.8692	17.6947	-0.1500
adjusted MIT	16.7251	17.1129	17.8725	18.7252	19.4243	19.7966	19.8905	19.8865	19.6539	18.8692	17.6947	16.6683 (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	0.8761	0.8454	0.7815	0.6797	0.5406	0.3561	0.2262	0.2408	0.4808	0.7064	0.8318	0.8875	(94)
Useful gains	992.7625	1090.7565	1178.6547	1193.8537	1009.3744	702.8942	415.3557	412.7981	728.8197	903.7988	941.7112	931.7036	(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	2229.3864	2192.9653	2009.0395	1706.4256	1236.8742	762.0678	428.3976	427.6199	851.5134	1343.4468	1817.8152	2184.2408	(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	920.0482	740.6843	617.8063	369.0518	169.2598	0.0000	0.0000	0.0000	0.0000	327.0981	630.7948	931.8877	(98)
Space heating												4706.6311	(98)
Space heating per m2												(98) / (4) =	27.5564 (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													5194.9570 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	920.0482	740.6843	617.8063	369.0518	169.2598	0.0000	0.0000	0.0000	0.0000	327.0981	630.7948	931.8877	(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)	1015.5057	817.5324	681.9054	407.3419	186.8210	0.0000	0.0000	0.0000	0.0000	361.0354	696.2415	1028.5736	(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	217.6419	191.6970	201.0102	179.7569	175.8405	156.6669	150.0308	165.2245	165.1189	186.4188	197.6663	212.2586	(64)
Efficiency of water heater	88.3369	88.1723	87.7163	86.7930	84.8128	79.9000	79.9000	79.9000	79.9000	86.3997	87.7948	88.4037	(216)
(217)m	246.3770	217.4118	229.1594	207.1099	207.3279	196.0787	187.7733	206.7891	206.6569	215.7634	225.1459	240.1015	(219)
Fuel for water heating, kWh/month												2585.6948	(219)
Water heating fuel used													
Annual totals kWh/year													
Space heating fuel - main system												5194.9570	(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)													120.5738 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													195.5738 (231)
Electricity for lighting (calculated in Appendix L)													551.7714 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.96 * 961 * 1.00) =										-737.8880		-737.8880	(233)
Total delivered energy for all uses												7790.1090	(238)

10a. Fuel costs - using BEDF prices (505)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	5194.9570	3.7400	194.2914	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	2585.6948	3.7400	96.7050	(247)
Mechanical ventilation fans	120.5738	20.4300	24.6332	(249)
Pumps and fans for heating	75.0000	20.4300	15.3225	(249)
Energy for lighting	551.7714	20.4300	112.7269	(250)
Additional standing charges			95.0000	(251)
Energy saving/generation technologies				
PV Unit	-737.8880	20.4300	-150.7505	(252)
Total energy cost			387.9285	(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	5194.9570	0.2160	1122.1107	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2585.6948	0.2160	558.5101	(264)
Space and water heating			1680.6208	(265)
Pumps and fans	195.5738	0.5190	101.5028	(267)
Energy for lighting	551.7714	0.5190	286.3693	(268)
Energy saving/generation technologies				

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

PV Unit	-737.8880	0.5190	-382.9639 (269)
Total kg/year			1685.5291 (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	5194.9570	1.2200	6337.8476 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2585.6948	1.2200	3154.5476 (264)
Space and water heating			9492.3952 (265)
Pumps and fans	195.5738	3.0700	600.4116 (267)
Energy for lighting	551.7714	3.0700	1693.9381 (268)
Energy saving/generation technologies			
PV Unit	-737.8880	3.0700	-2265.3162 (269)
Primary energy kWh/year			9521.4287 (272)
Primary energy kWh/m2/year			55.7461 (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	+ 1.1	-£ 41	-270 kg (16.0%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£41 1.58 kg/m²	B 89	B 89
Total Savings	£41 1.58 kg/m²		

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

Fuel prices for cost data on this page from database revision number 505 TEST (31 Aug 2022)
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	£153	£163	-£10
Mains gas	£386	£335	£51
Space heating	£329	£330	-£1
Water heating	£97	£55	£42
Lighting	£113	£113	£0
Generated (PV)	-£151	-£151	£0
Total cost of fuels	£388	£347	£41
Total cost of uses	£388	£347	£41
Delivered energy	46 kWh/m²	38 kWh/m²	8 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	1.7 tonnes	1.4 tonnes	0.3 tonnes
CO2 emissions per m ²	10 kg/m ²	8 kg/m ²	2 kg/m ²
Primary energy	56 kWh/m ²	47 kWh/m ²	9 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	65.4500 (1b)	x 2.4000 (2b)	= 157.0800 (1b) - (3b)
First floor	64.4100 (1c)	x 2.6900 (2c)	= 173.2629 (1c) - (3c)
Second floor	40.9400 (1d)	x 2.3900 (2d)	= 97.8466 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	170.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 428.1895 (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							4.7100					
Infiltration rate							0.2355	(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) =	0.2355 (21)				
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
	0.3003	0.2944	0.2885	0.2591	0.2532	0.2237	0.2237	0.2178	0.2355	0.2532	0.2649	0.2767 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5503	0.5444	0.5385	0.5091	0.5032	0.5000	0.5000	0.5000	0.5000	0.5032	0.5149	0.5267 (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			4.2500	1.3000	5.5250			(26)					
Window (Uw = 1.40)			24.0200	1.3258	31.8447			(27)					
French Door (Uw = 1.40)			5.2200	1.3258	6.9205			(27)					
Roof Window (Uw = 1.80)			0.9000	1.6791	1.5112			(27a)					
150mm EPS B&B			51.3600	0.1800	9.2448	75.0000	3852.0000	(28a)					
140mm Timber Frame	193.8600	29.9000	163.9600	0.1900	31.1524	9.0000	1475.6400	(29a)					
W2V	14.8500		14.8500	0.1400	2.0790	18.0000	267.3000	(29a)					
Dormer Cheek	11.9700	3.5900	8.3800	0.3200	2.6816	18.0000	150.8400	(29a)					
400mm Mineral Wool	14.7000		14.7000	0.1100	1.6170	9.0000	132.3000	(30)					
Bay Flat	1.0500		1.0500	0.2500	0.2625	9.0000	9.4500	(30)					
Sloping	23.4900	0.9000	22.5900	0.2000	4.5180	9.0000	203.3100	(30)					
Dormer Roof	8.5000		8.5000	0.2800	2.3800	9.0000	76.5000	(30)					
C2V	23.4700		23.4700	0.1400	3.2858	9.0000	211.2300	(30)					
Total net area of external elements Aum(A, m2)			343.2500					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	103.0224			(33)					
Timber GF			114.3800			9.0000	1029.4200	(32c)					
Timber FF			133.7300			9.0000	1203.5700	(32c)					
Timber 2F			56.7900			9.0000	511.1100	(32c)					
Internal Floor			64.4100			18.0000	1159.3800	(32d)					
Internal Floor 2			40.9400			18.0000	736.9200	(32d)					
Internal Ceiling			64.4100			18.0000	1159.3800	(32e)					
Internal Ceiling 2			40.9400			18.0000	736.9200	(32e)					
Heat capacity Cm = Sum(A x k)				(28) ... (30) + (32) + (32a) ... (32e) =			12915.2700	(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							75.6163	(35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							21.9013	(36)					
Total fabric heat loss				(33) + (36) =			124.9237	(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	77.7535	76.9216	76.0896	71.9301	71.0981	70.6513	70.6513	70.6513	70.6513	71.0981	72.7620	74.4258	(38)
Average = Sum(39)m / 12 =	202.6772	201.8453	201.0134	196.8538	196.0219	195.5750	195.5750	195.5750	195.5750	196.0219	197.6857	199.3495	(39)
												197.8140	(39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1866	1.1818	1.1769	1.1525	1.1477	1.1451	1.1451	1.1451	1.1451	1.1477	1.1574	1.1672	(40)
Days in month												1.1582	(40)
	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													2.9636 (42)
Average daily hot water use (litres/day)													104.5865 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	115.0452	110.8617	106.6783	102.4948	98.3113	94.1279	94.1279	98.3113	102.4948	106.6783	110.8617	115.0452	(44)
Energy content (annual)	170.6087	149.2154	153.9770	134.2409	128.8073	111.1509	102.9976	118.1913	119.6029	139.3856	152.1503	165.2254	(45)
Distribution loss (46)m = 0.15 x (45)m	25.5913	22.3823	23.0965	20.1361	19.3211	16.6726	15.4496	17.7287	17.9404	20.9078	22.8225	24.7838	(46)
Water storage loss:													
Store volume													210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.4200 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.7668 (55)
Total storage loss	23.7708	21.4704	23.7708	23.0040	23.7708	23.0040	23.7708	23.7708	23.0040	23.7708	23.0040	23.7708	(56)
If cylinder contains dedicated solar storage	15.2812	13.8024	15.2812	14.7883	15.2812	14.7883	15.2812	15.2812	14.7883	15.2812	14.7883	15.2812	(57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month	209.1523	184.0290	191.1249	164.7875	154.5566	135.8445	128.5143	144.6385	151.5003	176.5335	189.4506	203.7690	(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													1.1021 (H8)
Utilisation factor													0.5964 (H9)
Collector performance factor													0.8793 (H10)
Dedicated solar storage volume													75.0000 (H11)
Effective solar volume													115.5000 (H13)
Daily hot water demand													104.5865 (H14)
Volume ratio Veff/V													1.1043 (H15)
Solar storage volume factor													1.0000 (H16)
Solar input													-951.0777 (H17)
Solar input	-27.5794	-46.0220	-78.3808	-105.0457	-129.7751	-127.5896	-125.9034	-110.0025	-86.1540	-58.8330	-32.7131	-23.0792	(63)
Output from w/h	181.5729	138.0070	112.7441	59.7419	24.7815	8.2549	2.6109	34.6360	65.3463	117.7005	156.7375	180.6898	(64)
Heat gains from water heating, kWh/month	87.5623	77.4650	80.9156	69.0724	63.4279	56.7125	54.6601	60.4564	65.2859	76.0640	80.4302	85.7723	(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	177.8186	177.8186	177.8186	177.8186	177.8186	177.8186	177.8186	177.8186	177.8186	177.8186	177.8186	177.8186	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	78.1089	69.3757	56.4201	42.7136	31.9289	26.9558	29.1267	37.8599	50.8155	64.5220	75.3067	80.2798	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	510.9921	516.2946	502.9325	474.4861	438.5776	404.8288	382.2824	376.9799	390.3421	418.7884	454.6969	488.4458	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.7455	55.7455	55.7455	55.7455	55.7455	55.7455	55.7455	55.7455	55.7455	55.7455	55.7455	55.7455	(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)	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	(71)
Water heating gains (Table 5)	117.6912	115.2753	108.7576	95.9339	85.2525	78.7674	73.4678	81.2585	90.6748	102.2366	111.7086	115.2854	(72)
Total internal gains	824.8107	818.9640	786.1285	731.1520	673.7775	628.5703	602.8953	614.1168	649.8508	703.5654	759.7305	802.0294	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a	g Specific data or Table 6b		FF Specific data or Table 6c	Access factor Table 6d		Gains W	
Northeast					4.0200	11.2829	0.7200		0.7000	0.7700		15.8421 (75)	
Southeast					12.9100	36.7938	0.7200		0.7000	0.7700		165.9071 (77)	
Northwest					7.0900	11.2829	0.7200		0.7000	0.7700		27.9404 (81)	
Northwest					5.2200	11.2829	0.7200		0.7000	0.7700		20.5711 (81)	
Northwest					0.9000	26.0000	0.6300		0.7000	1.0000		9.2875 (82)	
Solar gains	239.5481	432.8840	656.9680	920.2748	1126.2178	1159.6362	1100.7472	941.0251	747.3381	495.9948	291.4798	202.0377	(83)
Total gains	1064.3588	1251.8480	1443.0965	1651.4269	1799.9953	1788.2065	1703.6425	1555.1418	1397.1889	1199.5601	1051.2103	1004.0671	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000 (85)
---	--------------

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	17.7009	17.7739	17.8474	18.2246	18.3019	18.3437	18.3437	18.3437	18.3437	18.3019	18.1479	17.9964
alpha	2.1801	2.1849	2.1898	2.2150	2.2201	2.2229	2.2229	2.2229	2.2229	2.2201	2.2099	2.1998
util living area	0.9435	0.9197	0.8788	0.8031	0.6938	0.5609	0.4435	0.4913	0.6777	0.8451	0.9226	0.9495 (86)
MIT	18.1248	18.4605	19.0036	19.7073	20.2956	20.6945	20.8711	20.8335	20.5054	19.7425	18.8271	18.0836 (87)
Th 2	19.9307	19.9346	19.9385	19.9582	19.9621	19.9642	19.9642	19.9642	19.9642	19.9621	19.9542	19.9464 (88)
util rest of house	0.9364	0.9097	0.8635	0.7776	0.6523	0.4964	0.3562	0.4033	0.6194	0.8193	0.9114	0.9431 (89)
MIT 2	16.0983	16.5815	17.3593	18.3592	19.1628	19.6741	19.8724	19.8386	19.4585	18.4322	17.1249	16.0447 (90)
Living area fraction									fLA = Living area / (4) =			0.1011 (91)
MIT	16.3032	16.7715	17.5256	18.4955	19.2773	19.7772	19.9734	19.9392	19.5644	18.5647	17.2970	16.2509 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.1532	16.6215	17.3756	18.3455	19.1273	19.6272	19.8234	19.7892	19.4144	18.4147	17.1470	16.1009 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8979	0.8650	0.8136	0.7287	0.6138	0.4732	0.3434	0.3870	0.5833	0.7687	0.8674	0.9071 (94)
Useful gains	955.7041	1082.8949	1174.0473	1203.4446	1104.8482	846.1665	584.9965	601.8086	814.9901	922.1083	911.8381	910.7499 (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	2402.3816	2365.9252	2186.1340	1859.3902	1455.9127	983.2042	630.4096	662.8497	1039.3551	1531.8466	1986.1444	2372.4376 (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	1076.3280	862.1964	752.9925	472.2808	261.1920	0.0000	0.0000	0.0000	0.0000	453.6454	773.5005	1087.4956 (98)
Space heating												5739.6313 (98)
Space heating per m2										(98) / (4) =		33.6044 (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												6335.1338 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	1076.3280	862.1964	752.9925	472.2808	261.1920	0.0000	0.0000	0.0000	0.0000	453.6454	773.5005	1087.4956 (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)	1188.0000	951.6516	831.1176	521.2812	288.2914	0.0000	0.0000	0.0000	0.0000	500.7123	853.7533	1200.3263 (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	181.5729	138.0070	112.7441	59.7419	24.7815	8.2549	2.6109	34.6360	65.3463	117.7005	156.7375	180.6898 (64)
Efficiency of water heater (217)m	88.8819	88.9563	89.0470	89.2578	89.5607	79.9000	79.9000	79.9000	79.9000	88.1677	88.6008	79.9000 (216)
Fuel for water heating, kWh/month	204.2857	155.1403	126.6118	66.9318	27.6701	10.3315	3.2677	43.3492	81.7851	133.4962	176.9030	203.2422 (219)
Water heating fuel used												1233.0148 (219)
Annual totals kWh/year												
Space heating fuel - main system												6335.1338 (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)												120.5738 (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												245.5738 (231)
Electricity for lighting (calculated in Appendix L)												551.7714 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV Unit 0 (0.80 * 0.96 * 853 * 1.00) =										-655.1270		-655.1270 (233)
Total delivered energy for all uses												7710.3668 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	6335.1338	3.4800	220.4627 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1233.0148	3.4800	42.9089 (247)
Mechanical ventilation fans	120.5738	13.1900	15.9037 (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	551.7714	13.1900	72.7786 (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	-655.1270	13.1900	-86.4112 (252)
Total energy cost			402.1302 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.7826 (257)
SAP value		89.0821
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	6335.1338	0.2160	1368.3889 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1233.0148	0.2160	266.3312 (264)
Space and water heating			1634.7201 (265)
Pumps and fans	245.5738	0.5190	127.4528 (267)
Energy for lighting	551.7714	0.5190	286.3693 (268)
Energy saving/generation technologies			
PV Unit	-655.1270	0.5190	-340.0109 (269)
Total kg/year			1708.5314 (272)
CO2 emissions per m2			10.0000 (273)
EI value			89.3910
EI rating			89 (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	65.4500 (1b)	x 2.4000 (2b)	= 157.0800 (1b) - (3b)
First floor	64.4100 (1c)	x 2.6900 (2c)	= 173.2629 (1c) - (3c)
Second floor	40.9400 (1d)	x 2.3900 (2d)	= 97.8466 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	170.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 428.1895 (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							4.7100					
Infiltration rate							0.2355	(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) =	0.2355 (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)
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												
	0.2591	0.2414	0.2414	0.2296	0.2296	0.2178	0.2178	0.2061	0.2061	0.2237	0.2178	0.2296 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5091	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K							
Solid Door			4.2500	1.3000	5.5250			(26)						
Window (Uw = 1.40)			24.0200	1.3258	31.8447			(27)						
French Door (Uw = 1.40)			5.2200	1.3258	6.9205			(27)						
Roof Window (Uw = 1.80)			0.9000	1.6791	1.5112			(27a)						
150mm EPS B&B			51.3600	0.1800	9.2448	75.0000	3852.0000	(28a)						
140mm Timber Frame	193.8600	29.9000	163.9600	0.1900	31.1524	9.0000	1475.6400	(29a)						
W2V	14.8500		14.8500	0.1400	2.0790	18.0000	267.3000	(29a)						
Dormer Cheek	11.9700	3.5900	8.3800	0.3200	2.6816	18.0000	150.8400	(29a)						
400mm Mineral Wool	14.7000		14.7000	0.1100	1.6170	9.0000	132.3000	(30)						
Bay Flat	1.0500		1.0500	0.2500	0.2625	9.0000	9.4500	(30)						
Sloping	23.4900	0.9000	22.5900	0.2000	4.5180	9.0000	203.3100	(30)						
Dormer Roof	8.5000		8.5000	0.2800	2.3800	9.0000	76.5000	(30)						
C2V	23.4700		23.4700	0.1400	3.2858	9.0000	211.2300	(30)						
Total net area of external elements Aum(A, m2)			343.2500					(31)						
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	103.0224			(33)						
Timber GF			114.3800			9.0000	1029.4200	(32c)						
Timber FF			133.7300			9.0000	1203.5700	(32c)						
Timber 2F			56.7900			9.0000	511.1100	(32c)						
Internal Floor			64.4100			18.0000	1159.3800	(32d)						
Internal Floor 2			40.9400			18.0000	736.9200	(32d)						
Internal Ceiling			64.4100			18.0000	1159.3800	(32e)						
Internal Ceiling 2			40.9400			18.0000	736.9200	(32e)						
Heat capacity Cm = Sum(A x k)					(28) ... (30) + (32) + (32a) ... (32e) =		12915.2700	(34)						
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							75.6163	(35)						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							21.9013	(36)						
Total fabric heat loss						(33) + (36) =	124.9237	(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	71.9301	70.6513	70.6513	70.6513	70.6513	70.6513	70.6513	70.6513	70.6513	70.6513	70.6513	70.6513	(38)	
Average = Sum(39)m / 12 =	196.8538	195.5750	195.5750	195.5750	195.5750	195.5750	195.5750	195.5750	195.5750	195.5750	195.5750	195.5750	(39)	
													195.6815	(39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
HLP (average)	1.1525	1.1451	1.1451	1.1451	1.1451	1.1451	1.1451	1.1451	1.1451	1.1451	1.1451	1.1451	1.1451	(40)
Days in month														(40)
	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	2.9636 (42)											
Average daily hot water use (litres/day)	104.5865 (43)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	115.0452	110.8617	106.6783	102.4948	98.3113	94.1279	94.1279	98.3113	102.4948	106.6783	110.8617	115.0452 (44)
Energy content (annual)	170.6087	149.2154	153.9770	134.2409	128.8073	111.1509	102.9976	118.1913	119.6029	139.3856	152.1503	165.2254 (45)
Distribution loss (46)m = 0.15 x (45)m	25.5913	22.3823	23.0965	20.1361	19.3211	16.6726	15.4496	17.7287	17.9404	20.9078	22.8225	24.7838 (46)
Water storage loss:												
Store volume												210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.4200 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7668 (55)
Total storage loss	23.7708	21.4704	23.7708	23.0040	23.7708	23.0040	23.7708	23.7708	23.0040	23.7708	23.0040	23.7708 (56)
If cylinder contains dedicated solar storage	15.2812	13.8024	15.2812	14.7883	15.2812	14.7883	15.2812	15.2812	14.7883	15.2812	14.7883	15.2812 (57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	209.1523	184.0290	191.1249	164.7875	154.5566	135.8445	128.5143	144.6385	151.5003	176.5335	189.4506	203.7690 (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												1.2257 (H8)
Utilisation factor												0.5577 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												115.5000 (H13)
Daily hot water demand												104.5865 (H14)
Volume ratio Veff/V												1.1043 (H15)
Solar storage volume factor												1.0000 (H16)
Solar input												-989.1585 (H17)
Solar input	-32.4719	-46.1730	-79.3602	-107.0753	-125.1438	-134.9276	-128.4405	-117.0651	-91.4749	-62.9080	-38.4057	-25.7124 (63)
Output from w/h	176.6804	137.8561	111.7646	57.7122	29.4128	0.9169	0.0738	27.5734	60.0254	113.6255	151.0449	178.0566 (64)
Heat gains from water heating, kWh/month	87.5623	77.4650	80.9156	69.0724	63.4279	56.7125	54.6601	60.4564	65.2859	76.0640	80.4302	85.7723 (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	177.8186	177.8186	177.8186	177.8186	177.8186	177.8186	177.8186	177.8186	177.8186	177.8186	177.8186	177.8186 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	78.1089	69.3757	56.4201	42.7136	31.9289	26.9558	29.1267	37.8599	50.8155	64.5220	75.3067	80.2798 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	510.9921	516.2946	502.9325	474.4861	438.5776	404.8288	382.2824	376.9799	390.3421	418.7884	454.6969	488.4458 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.7455	55.7455	55.7455	55.7455	55.7455	55.7455	55.7455	55.7455	55.7455	55.7455	55.7455	55.7455 (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)	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457	-118.5457 (71)
Water heating gains (Table 5)	117.6912	115.2753	108.7576	95.9339	85.2525	78.7674	73.4678	81.2585	90.6748	102.2366	111.7086	115.2854 (72)
Total internal gains	824.8107	818.9640	786.1285	731.1520	673.7775	628.5703	602.8953	614.1168	649.8508	703.5654	759.7305	802.0294 (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				4.0200	14.6176		0.7200		0.7000		0.7700		20.5243 (75)
Southeast				12.9100	45.1778		0.7200		0.7000		0.7700		203.7114 (77)
Northwest				7.0900	14.6176		0.7200		0.7000		0.7700		36.1982 (81)
Northwest				5.2200	14.6176		0.7200		0.7000		0.7700		26.6509 (81)
Northwest				0.9000	34.0000		0.6300		0.7000		1.0000		12.1451 (82)
Solar gains	299.2299	462.0761	711.4833	1008.6467	1170.3322	1321.8849	1210.3581	1078.1156	850.7124	565.3147	363.3114		238.6599 (83)
Total gains	1124.0406	1281.0401	1497.6118	1739.7987	1844.1097	1950.4552	1813.2534	1692.2323	1500.5632	1268.8801	1123.0419		1040.6893 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000 (85)
---	--------------

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	18.2246	18.3437	18.3437	18.3437	18.3437	18.3437	18.3437	18.3437	18.3437	18.3437	18.3437	18.3437
alpha	2.2150	2.2229	2.2229	2.2229	2.2229	2.2229	2.2229	2.2229	2.2229	2.2229	2.2229	2.2229
util living area	0.9288	0.9051	0.8521	0.7592	0.6269	0.4478	0.3320	0.3524	0.5828	0.7931	0.8969	0.9370 (86)
MIT	18.5179	18.7969	19.3485	19.9800	20.5222	20.8476	20.9467	20.9398	20.7049	20.0741	19.2105	18.4743 (87)
Th 2	19.9582	19.9642	19.9642	19.9642	19.9642	19.9642	19.9642	19.9642	19.9642	19.9642	19.9642	19.9642 (88)
util rest of house	0.9196	0.8932	0.8332	0.7278	0.5753	0.3728	0.2361	0.2517	0.5092	0.7570	0.8814	0.9287 (89)
MIT 2	16.6766	17.0777	17.8612	18.7379	19.4584	19.8424	19.9377	19.9340	19.6982	18.8913	17.6789	16.6179 (90)
Living area fraction									fLA = Living area / (4) =			0.1011 (91)
MIT	16.8627	17.2515	18.0116	18.8635	19.5660	19.9441	20.0398	20.0357	19.8000	19.0109	17.8338	16.8056 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.7127	17.1015	17.8616	18.7135	19.4160	19.7941	19.8898	19.8857	19.6500	18.8609	17.6838	16.6556 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8775	0.8468	0.7832	0.6826	0.5447	0.3595	0.2288	0.2436	0.4841	0.7088	0.8335	0.8889 (94)
Useful gains	986.3110	1084.8470	1172.9634	1187.5038	1004.4668	701.2797	414.9058	412.2814	726.4323	899.3389	936.0281	925.0468 (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	2226.9557	2190.7379	2006.9105	1704.1485	1235.2505	761.5799	428.2611	427.4624	850.7426	1341.8178	1815.6701	2181.7494 (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	923.0397	743.1587	620.4566	371.9842	171.7031	0.0000	0.0000	0.0000	0.0000	329.2043	633.3423	934.9868 (98)
Space heating												4727.8756 (98)
Space heating per m2										(98) / (4) =		27.6808 (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												5218.4057 (211)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	923.0397	743.1587	620.4566	371.9842	171.7031	0.0000	0.0000	0.0000	0.0000	329.2043	633.3423	934.9868 (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)	1018.8076	820.2635	684.8307	410.5785	189.5177	0.0000	0.0000	0.0000	0.0000	363.3602	699.0533	1031.9942 (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	176.6804	137.8561	111.7646	57.7122	29.4128	0.9169	0.0738	27.5734	60.0254	113.6255	151.0449	178.0566 (64)
Efficiency of water heater	88.6918	88.7405	88.7852	88.9992	88.8597	79.9000	79.9000	79.9000	79.9000	87.5902	88.3224	79.9000 (216)
Fuel for water heating, kWh/month	199.2072	155.3475	125.8821	64.8457	33.1003	1.1475	0.0924	34.5098	75.1257	129.7239	171.0155	200.7408 (219)
Water heating fuel used												1190.7383 (219)
Annual totals kWh/year												
Space heating fuel - main system												5218.4057 (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)												120.5738 (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												245.5738 (231)
Electricity for lighting (calculated in Appendix L)												551.7714 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV Unit 0 (0.80 * 0.96 * 961 * 1.00) =									-737.8880			-737.8880 (233)
Total delivered energy for all uses												6468.6012 (238)

10a. Fuel costs - using BEDF prices (505)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	5218.4057	3.7400	195.1684 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1190.7383	3.7400	44.5336 (247)
Mechanical ventilation fans	120.5738	20.4300	24.6332 (249)
Pumps and fans for heating	75.0000	20.4300	15.3225 (249)
Pump for solar water heating	50.0000	20.4300	10.2150 (249)
Energy for lighting	551.7714	20.4300	112.7269 (250)
Additional standing charges			95.0000 (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	-737.8880	20.4300	-150.7505 (252)
Total energy cost			346.8491 (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	5218.4057	0.2160	1127.1756 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1190.7383	0.2160	257.1995 (264)
Space and water heating			1384.3751 (265)
Pumps and fans	245.5738	0.5190	127.4528 (267)
Energy for lighting	551.7714	0.5190	286.3693 (268)
Energy saving/generation technologies			
PV Unit	-737.8880	0.5190	-382.9639 (269)
Total kg/year			1415.2334 (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	5218.4057	1.2200	6366.4550 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1190.7383	1.2200	1452.7007 (264)
Space and water heating			7819.1557 (265)
Pumps and fans	245.5738	3.0700	753.9116 (267)
Energy for lighting	551.7714	3.0700	1693.9381 (268)
Energy saving/generation technologies			
PV Unit	-737.8880	3.0700	-2265.3162 (269)
Primary energy kWh/year			8001.6893 (272)
Primary energy kWh/m2/year			46.8483 (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	South East
Overshading	Average or unknown
Thermal mass parameter	75.6 (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	565.21 (P1)
Transmission heat loss coefficient	124.92 (P7)
Summer heat loss coefficient	690.13 (P2)

Overhangs	Ratio	Z_overhangs	Overhang type
Orientation			
North East	0.000	1.000	None
South East	0.000	1.000	None
North West	0.000	1.000	None
Solar shading	Z blinds	Solar access	Z overhangs
Orientation			
North East	1.000	0.90	1.000
South East	1.000	0.90	1.000
North West	1.000	0.90	1.000
North West	1.000	1.00	1.000

[Jul]	Area m2	Solar flux Table 6a W/m2	Specific data g or Table 6b	Specific data FF or Table 6c	Shading	Gains W
North East	4.0200	106.0502	0.7200	0.7000	0.9000	174.0416
South East	12.9100	127.3119	0.7200	0.7000	0.9000	670.9817
North West	7.0900	106.0502	0.7200	0.7000	0.9000	306.9540
North West	5.2200	106.0502	0.7200	0.7000	0.9000	225.9944
North West	0.9000	217.0000	0.6300	0.7000	1.0000	77.5146
total:						1455.4863

Jun Jul Aug

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



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

Solar gains	1571	1455	1269	(P3)
Internal gains	649	623	633	
Total summer gains	2220	2079	1902	(P5)
Summer gain/loss ratio	3.22	3.01	2.76	(P6)
Summer external temperature	15.40	17.30	17.30	
Thermal mass temperature increment (TMP = 75.6)	1.47	1.47	1.47	
Threshold temperature	20.09	21.78	21.53	(P7)
Likelihood of high internal temperature	Not significant	Slight	Slight	
Assessment of likelihood of high internal temperature:	Slight			