

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



Property Reference	4907-T511-3796-225			Issued on Date	17/07/2023
Assessment Reference	As Built	Prop Type Ref	J1 Semi As		
Property	15, Gore Copse Drive, Fair Oak, EASTLEIGH, SO50 7QT				
SAP Rating	87 B	DER	13.89	TER	17.37
Environmental	87 B	% DER<TER	20.04		
CO ₂ Emissions (t/year)	1.41	DFEE	50.26	TFEE	59.86
General Requirements Compliance	Pass	% DFEE<TFEE	16.03		
Assessor Details	Miss Lindsey Dean, Lindsey Dean, Tel: 01884 242050, Lindsey.dean@aessc.co.uk			Assessor ID	T510-0001
Client	Drew Smith				

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

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DWELLING AS BUILT

Semi-Detached House, total floor area 124 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas

Fuel factor:1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 17.37 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 13.89 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)59.9 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)50.3 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.33 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.18 (max. 0.25)	0.19 (max. 0.70)	OK
Roof	0.14 (max. 0.20)	0.31 (max. 0.35)	OK
Openings	1.44 (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: 4.06 (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: 1.20 kWh/day
Permitted by DBSCG 2.03 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: 6.17 m², No overhang
Windows facing South: 8.69 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 0.66 kW

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	41.2000 (1b)	x 2.6900 (2b)	= 110.8280 (1b) - (3b)
First floor	60.0800 (1c)	x 2.4300 (2c)	= 145.9944 (1c) - (3c)
Second floor	22.9600 (1d)	x 2.4300 (2d)	= 55.7928 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	124.2400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 312.6152 (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					4.0600
Infiltration rate					0.2030 (18)
Number of sides sheltered					1 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.1878 (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	0.2394	0.2347	0.2300	0.2066	0.2019	0.1784	0.1784	0.1737	0.1878	0.2019	0.2112	0.2206 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
Solid Door			2.1200	1.3000	2.7560			(26)					
Window (Uw = 1.40)			10.3500	1.3258	13.7216			(27)					
French Door (Uw = 1.40)			4.5100	1.3258	5.9792			(27)					
Roof Window (Uw = 1.80)			2.5300	1.6791	4.2481			(27a)					
150mm EPS B&B			41.2000	0.1700	7.0040	75.0000	3090.0000	(28a)					
Timber Floor to Garage			18.8800	0.1900	3.5872	20.0000	377.6000	(28b)					
140mm Timber Frame	125.6000	15.6700	109.9300	0.1900	20.8867	9.0000	989.3700	(29a)					
Timber Wall to Loft	8.4800		8.4800	0.1900	1.6112	9.0000	76.3200	(29a)					
Timber Wall to Garage	14.8000		14.8000	0.1900	2.8120	9.0000	133.2000	(29a)					
Wall to Void	22.6400		22.6400	0.1400	3.1696	9.0000	203.7600	(29a)					
Dormer Cheek	5.1900	1.3100	3.8800	0.3300	1.2804	9.0000	34.9200	(29a)					
Rooflight Stud Wall	4.1800		4.1800	0.3100	1.2958	9.0000	37.6200	(29a)					
400mm Mineral Wool	29.9100		29.9100	0.1100	3.2901	9.0000	269.1900	(30)					
Sloping	11.1900	0.8400	10.3500	0.2000	2.0700	9.0000	93.1500	(30)					
C2V	18.2400		18.2400	0.1400	2.5536	9.0000	164.1600	(30)					
Dormer Roof	2.7600		2.7600	0.2800	0.7728	9.0000	24.8400	(30)					
Rooflight Sloping	1.8000	1.6900	0.1100	0.3100	0.0341	9.0000	0.9900	(30)					
Total net area of external elements Aum(A, m2)			304.8700					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	77.0724			(33)					
Timebr Frame			62.1000	0.0000	0.0000	20.0000	1242.0000	(32)					
Timber GF			69.8900			9.0000	629.0100	(32c)					
Timber FF			117.5200			9.0000	1057.6800	(32c)					
Timber 2F			30.4100			9.0000	273.6900	(32c)					
Masonry FF			13.3700			39.0000	521.4300	(32c)					
Internal Floor			41.2000			18.0000	741.6000	(32d)					
Internal Floor 2			22.9600			18.0000	413.2800	(32d)					
Internal Ceiling			41.2000			18.0000	741.6000	(32e)					
Internal Ceiling 2			22.9600			18.0000	413.2800	(32e)					
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =				11528.6900 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								92.7937 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								24.2421 (36)					
Total fabric heat loss				(33) + (36) =				101.3145 (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	51.5815	51.5815	51.5815	51.5815	51.5815	51.5815	51.5815	51.5815	51.5815	51.5815	51.5815	51.5815	(38)
	152.8960	152.8960	152.8960	152.8960	152.8960	152.8960	152.8960	152.8960	152.8960	152.8960	152.8960	152.8960	(39)
Average = Sum(39)m / 12 =													152.8960 (39)

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	Jan 1.2307	Feb 1.2307	Mar 1.2307	Apr 1.2307	May 1.2307	Jun 1.2307	Jul 1.2307	Aug 1.2307	Sep 1.2307	Oct 1.2307	Nov 1.2307	Dec 1.2307 (40) 1.2307 (40)
HLP												
HLP (average)												
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												2.8783 (42)
Average daily hot water use (litres/day)												102.5599 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	112.8159	108.7135	104.6111	100.5087	96.4063	92.3039	92.3039	96.4063	100.5087	104.6111	108.7135	112.8159 (44)
Energy content (annual)	167.3028	146.3241	150.9933	131.6396	126.3114	108.9971	101.0018	115.9011	117.2853	136.6847	149.2021	162.0238 (45)
Energy content (annual)												1613.6671 (45)
Distribution loss (46)m = 0.15 x (45)m	25.0954	21.9486	22.6490	19.7459	18.9467	16.3496	15.1503	17.3852	17.5928	20.5027	22.3803	24.3036 (46)
Water storage loss:												
Store volume												170.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.2000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.6480 (55)
Total storage loss	20.0880	18.1440	20.0880	19.4400	20.0880	19.4400	20.0880	20.0880	19.4400	20.0880	19.4400	20.0880 (56)
If cylinder contains dedicated solar storage	20.0880	18.1440	20.0880	19.4400	20.0880	19.4400	20.0880	20.0880	19.4400	20.0880	19.4400	20.0880 (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	210.6532	185.4793	194.3437	173.5916	169.6618	150.9491	144.3522	159.2515	159.2373	180.0351	191.1541	205.3742 (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	210.6532	185.4793	194.3437	173.5916	169.6618	150.9491	144.3522	159.2515	159.2373	180.0351	191.1541	205.3742 (64)
Total per year (kWh/year) = Sum (64)m =												2124.0831 (64)
Heat gains from water heating, kWh/month	90.3085	79.9769	84.8856	77.3318	76.6789	69.8031	68.2634	73.2174	72.5590	80.1280	83.1713	88.5532 (65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabolic gains (Table 5), Watts												
(66)m	143.9156	143.9156	143.9156	143.9156	143.9156	143.9156	143.9156	143.9156	143.9156	143.9156	143.9156	143.9156 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.6223	24.5339	19.9523	15.1052	11.2913	9.5326	10.3003	13.3887	17.9703	22.8174	26.6313	28.3900 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	290.6350	293.6509	286.0510	269.8717	249.4481	230.2529	217.4293	214.4134	222.0134	238.1927	258.6162	277.8115 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3916	37.3916	37.3916	37.3916	37.3916	37.3916	37.3916	37.3916	37.3916	37.3916	37.3916	37.3916 (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)	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325 (71)
Water heating gains (Table 5)	121.3824	119.0133	114.0935	107.4053	103.0630	96.9488	91.7519	98.4105	100.7763	107.6989	115.5157	119.0232 (72)
Total internal gains	508.8144	506.3728	489.2716	461.5568	432.9771	405.9090	388.6563	395.3874	409.9347	437.8838	469.9379	494.3993 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North				1.6600	10.6334	0.7200	0.7000	0.7700	6.1652 (74)			
South				8.6900	46.7521	0.7200	0.7000	0.7700	141.9006 (78)			
North				4.5100	10.6334	0.7200	0.7000	0.7700	16.7499 (74)			
North				2.5300	16.1759	0.6300	0.7000	1.0000	16.2431 (82)			
Solar gains	181.0588	306.9507	426.3806	555.8118	659.8088	674.6676	642.0433	559.3101	469.2626	339.9784	216.3519	155.4165 (83)
Total gains	689.8733	813.3235	915.6521	1017.3686	1092.7859	1080.5767	1030.6996	954.6975	879.1974	777.8622	686.2898	649.8159 (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	20.9450	20.9450	20.9450	20.9450	20.9450	20.9450	20.9450	20.9450	20.9450	20.9450	20.9450	20.9450
alpha	2.3963	2.3963	2.3963	2.3963	2.3963	2.3963	2.3963	2.3963	2.3963	2.3963	2.3963	2.3963
util living area	0.9679	0.9518	0.9258	0.8764	0.7916	0.6698	0.5461	0.5923	0.7667	0.8990	0.9539	0.9720 (86)
MIT	18.2460	18.5353	19.0002	19.6002	20.1867	20.6280	20.8396	20.7986	20.4437	19.6990	18.8522	18.1710 (87)
Th 2	19.8956	19.8956	19.8956	19.8956	19.8956	19.8956	19.8956	19.8956	19.8956	19.8956	19.8956	19.8956 (88)
util rest of house	0.9631	0.9445	0.9141	0.8552	0.7521	0.5987	0.4396	0.4885	0.7083	0.8774	0.9457	0.9678 (89)
MIT 2	16.2161	16.6343	17.3048	18.1605	18.9733	19.5475	19.7868	19.7499	19.3322	18.3152	17.0990	16.1074 (90)
Living area fraction									fLA = Living area / (4) =			0.0691 (91)
MIT	16.3564	16.7658	17.4220	18.2600	19.0572	19.6222	19.8596	19.8224	19.4091	18.4109	17.2202	16.2500 (92)

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Temperature adjustment													-0.1500
adjusted MIT	16.2064	16.6158	17.2720	18.1100	18.9072	19.4722	19.7096	19.6724	19.2591	18.2609	17.0702		16.1000 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9370	0.9116	0.8741	0.8095	0.7085	0.5670	0.4193	0.4644	0.6664	0.8323	0.9130	0.9438	(94)
Useful gains	646.3772	741.4606	800.3726	823.5551	774.2451	612.6426	432.2196	443.3669	585.9108	647.3990	626.5797	613.2791	(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													
	1820.4421	1791.2938	1646.9988	1408.1771	1101.9511	744.9465	475.4498	500.3439	788.7988	1171.3230	1524.4010	1819.4670	(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													
	873.5043	705.4879	629.8900	420.9278	243.8132	0.0000	0.0000	0.0000	0.0000	389.7995	646.4313	897.4038	(98)
Space heating													4807.2578 (98)
Space heating per m2											(98) / (4) =		38.6933 (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													5306.0240 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	873.5043	705.4879	629.8900	420.9278	243.8132	0.0000	0.0000	0.0000	0.0000	389.7995	646.4313	897.4038	(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)	964.1328	778.6842	695.2428	464.6002	269.1095	0.0000	0.0000	0.0000	0.0000	430.2423	713.5003	990.5119	(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	210.6532	185.4793	194.3437	173.5916	169.6618	150.9491	144.3522	159.2515	159.2373	180.0351	191.1541	205.3742	(64)
Efficiency of water heater (217)m	88.3023	88.1427	87.8268	87.1907	85.8808	79.9000	79.9000	79.9000	79.9000	86.9223	87.9131	79.9000	(216)
Fuel for water heating, kWh/month	238.5590	210.4306	221.2807	199.0943	197.5549	188.9225	180.6661	199.3135	199.2958	207.1219	217.4352	232.3358	(219)
Water heating fuel used												2492.0103	(219)
Annual totals kWh/year													
Space heating fuel - main system												5306.0240	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 10.3610, total flow = 45.0000, SFP = 0.2302)													
mechanical ventilation fans (SFP = 0.2302)													87.8131 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													162.8131 (231)
Electricity for lighting (calculated in Appendix L)													487.8190 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.66 * 1080 * 1.00) =										-569.9890		-569.9890	(233)
Total delivered energy for all uses													7878.6774 (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	5306.0240	0.2160	1146.1012	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2492.0103	0.2160	538.2742	(264)
Space and water heating			1684.3754	(265)
Pumps and fans	162.8131	0.5190	84.5000	(267)
Energy for lighting	487.8190	0.5190	253.1780	(268)
Energy saving/generation technologies				
PV Unit	-569.9890	0.5190	-295.8243	(269)
Total CO2, kg/year			1726.2291	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			13.8900	(273)

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

DER			13.8900	ZC1
Total Floor Area		TFA	124.2400	
Assumed number of occupants		N	2.8783	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			13.8622	ZC2
CO2 emissions from cooking, equation (L16)			1.5138	ZC3
Total CO2 emissions			29.2661	ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year			0.0000	ZC6

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Resulting CO2 emissions offset from additional allowable electricity generation
Net CO2 emissions

0.0000 ZC7
29.2661 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	41.2000 (1b)	x 2.6900 (2b)	= 110.8280 (1b) - (3b)
First floor	60.0800 (1c)	x 2.4300 (2c)	= 145.9944 (1c) - (3c)
Second floor	22.9600 (1d)	x 2.4300 (2d)	= 55.7928 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	124.2400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 312.6152 (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							4 * 10 =	40.0000 (7a)				
Number of passive vents							0 * 10 =	0.0000 (7b)				
Number of flueless gas fires							0 * 40 =	0.0000 (7c)				
							Air changes per hour					
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						40.0000 / (5) =	0.1280 (8)				
Pressure test							Yes					
Measured/design AP50							5.0000					
Infiltration rate							0.3780	(18)				
Number of sides sheltered							1	(19)				
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.9250 (20)				
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.3496 (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	0.4457	0.4370	0.4283	0.3846	0.3758	0.3321	0.3321	0.3234	0.3496	0.3758	0.3933	0.4108 (22b)
Effective ac	0.5993	0.5955	0.5917	0.5739	0.5706	0.5552	0.5552	0.5523	0.5611	0.5706	0.5773	0.5844 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			2.1200	1.0000	2.1200		(26)					
TER Opening Type (Uw = 1.40)			14.8600	1.3258	19.7008		(27)					
TER Room Window (Uw = 1.70)			2.5300	1.5918	4.0272		(27a)					
150mm EPS B&B			41.2000	0.1300	5.3560		(28a)					
Timber Floor to Garage			18.8800	0.1300	2.4544		(28b)					
140mm Timber Frame	125.6000	15.6700	109.9300	0.1800	19.7874		(29a)					
Timber Wall to Loft	8.4800		8.4800	0.1800	1.5264		(29a)					
Timber Wall to Garage	14.8000		14.8000	0.1800	2.6640		(29a)					
Wall to Void	22.6400		22.6400	0.1800	4.0752		(29a)					
Dormer Cheek	5.1900	1.3100	3.8800	0.1800	0.6984		(29a)					
Rooflight Stud Wall	4.1800		4.1800	0.1800	0.7524		(29a)					
400mm Mineral Wool	29.9100		29.9100	0.1300	3.8883		(30)					
Sloping	11.1900	0.8400	10.3500	0.1300	1.3455		(30)					
C2V	18.2400		18.2400	0.1300	2.3712		(30)					
Dormer Roof	2.7600		2.7600	0.1300	0.3588		(30)					
Rooflight Sloping	1.8000	1.6900	0.1100	0.1300	0.0143		(30)					
Total net area of external elements Aum(A, m2)			304.8700				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	71.1402		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							21.1352 (36)					
Total fabric heat loss						(33) + (36) =	92.2754 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 61.8303	Feb 61.4323	Mar 61.0422	Apr 59.2100	May 58.8672	Jun 57.2713	Jul 57.2713	Aug 56.9758	Sep 57.8860	Oct 58.8672	Nov 59.5607	Dec 60.2857 (38)
Heat transfer coeff	154.1057	153.7077	153.3177	151.4854	151.1426	149.5468	149.5468	149.2512	150.1614	151.1426	151.8361	152.5611 (39)
Average = Sum(39)m / 12 =												151.4838 (39)
HLP	Jan 1.2404	Feb 1.2372	Mar 1.2340	Apr 1.2193	May 1.2165	Jun 1.2037	Jul 1.2037	Aug 1.2013	Sep 1.2086	Oct 1.2165	Nov 1.2221	Dec 1.2280 (40)
HLP (average)												1.2193 (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	2.8783 (42)
Average daily hot water use (litres/day)	102.5599 (43)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	112.8159	108.7135	104.6111	100.5087	96.4063	92.3039	92.3039	96.4063	100.5087	104.6111	108.7135	112.8159	(44)
Energy conte	167.3028	146.3241	150.9933	131.6396	126.3114	108.9971	101.0018	115.9011	117.2853	136.6847	149.2021	162.0238	(45)
Energy content (annual)	Total = Sum (45)m =												1613.6671 (45)
Distribution loss (46)m = 0.15 x (45)m	25.0954	21.9486	22.6490	19.7459	18.9467	16.3496	15.1503	17.3852	17.5928	20.5027	22.3803	24.3036	(46)
Water storage loss:													
Store volume													170.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.5003 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.8102 (55)
Total storage loss	25.1153	22.6848	25.1153	24.3051	25.1153	24.3051	25.1153	25.1153	24.3051	25.1153	24.3051	25.1153	(56)
If cylinder contains dedicated solar storage	25.1153	22.6848	25.1153	24.3051	25.1153	24.3051	25.1153	25.1153	24.3051	25.1153	24.3051	25.1153	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month	215.6805	190.0201	199.3710	178.4568	174.6891	155.8142	149.3795	164.2788	164.1024	185.0624	196.0192	210.4015	(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	215.6805	190.0201	199.3710	178.4568	174.6891	155.8142	149.3795	164.2788	164.1024	185.0624	196.0192	210.4015	(64)
Heat gains from water heating, kWh/month	94.3303	83.6095	88.9074	81.2239	80.7007	73.6952	72.2853	77.2393	76.4511	84.1498	87.0634	92.5751	(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	143.9156	143.9156	143.9156	143.9156	143.9156	143.9156	143.9156	143.9156	143.9156	143.9156	143.9156	143.9156	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.6223	24.5339	19.9523	15.1052	11.2913	9.5326	10.3003	13.3887	17.9703	22.8174	26.6313	28.3900	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	290.6350	293.6509	286.0510	269.8717	249.4481	230.2529	217.4293	214.4134	222.0134	238.1927	258.6162	277.8115	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3916	37.3916	37.3916	37.3916	37.3916	37.3916	37.3916	37.3916	37.3916	37.3916	37.3916	37.3916	(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)	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	(71)
Water heating gains (Table 5)	126.7881	124.4190	119.4993	112.8110	108.4687	102.3545	97.1576	103.8162	106.1820	113.1046	120.9214	124.4289	(72)
Total internal gains	514.2201	511.7785	494.6773	466.9625	438.3828	411.3147	394.0620	400.7931	415.3404	443.2895	475.3436	499.8050	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North				6.1700	10.6334	0.6300	0.7000	0.7700	20.0507 (74)			
South				8.6900	46.7521	0.6300	0.7000	0.7700	124.1631 (78)			
North				2.5300	16.1759	0.6300	0.7000	1.0000	16.2431 (82)			
Solar gains	160.4569	272.4271	380.0749	499.0484	596.1005	611.1800	580.9479	503.5539	419.4240	302.1296	191.7933	137.7017 (83)
Total gains	674.6770	784.2056	874.7522	966.0109	1034.4833	1022.4947	975.0098	904.3470	834.7644	745.4191	667.1369	637.5068 (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	55.9861	56.1311	56.2739	56.9545	57.0837	57.6928	57.6928	57.8071	57.4567	57.0837	56.8230	56.5529	
alpha	4.7324	4.7421	4.7516	4.7970	4.8056	4.8462	4.8462	4.8538	4.8304	4.8056	4.7882	4.7702	
util living area	0.9987	0.9971	0.9928	0.9776	0.9272	0.8004	0.6386	0.6992	0.9045	0.9852	0.9972	0.9990	(86)
MIT	19.5872	19.7404	19.9914	20.3366	20.6666	20.8962	20.9735	20.9594	20.7898	20.3745	19.9217	19.5644	(87)
Th 2	19.8878	19.8904	19.8929	19.9046	19.9068	19.9170	19.9170	19.9189	19.9131	19.9068	19.9023	19.8977	(88)
util rest of house	0.9982	0.9960	0.9900	0.9679	0.8935	0.7113	0.4991	0.5626	0.8465	0.9772	0.9961	0.9987	(89)
MIT 2	18.0049	18.2305	18.5981	19.1043	19.5610	19.8426	19.9067	19.9009	19.7309	19.1649	18.5043	17.9783	(90)
Living area fraction	18.1143	18.3349	18.6944	19.1895	19.6374	19.9155	19.9805	19.9741	19.8041	19.2485	18.6023	18.0880	(91)
MIT	18.1143	18.3349	18.6944	19.1895	19.6374	19.9155	19.9805	19.9741	19.8041	19.2485	18.6023	18.0880	(92)
Temperature adjustment	18.1143	18.3349	18.6944	19.1895	19.6374	19.9155	19.9805	19.9741	19.8041	19.2485	18.6023	18.0880	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9970	0.9937	0.9854	0.9591	0.8829	0.7111	0.5079	0.5703	0.8390	0.9699	0.9938	0.9977	(94)
Useful gains	672.6704	779.2553	861.9866	926.5353	913.3223	727.1285	495.2294	515.7589	700.3462	723.0123	663.0096	636.0569	(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	2128.8608	2065.0412	1869.6157	1558.7049	1199.6866	794.9129	505.5430	533.4399	856.5377	1307.1585	1746.4598	2118.7687	(97)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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	1083.4057	864.0481	749.6760	455.1621	213.0550	0.0000	0.0000	0.0000	0.0000	434.6048	780.0842	1103.1376 (98)
Space heating												5683.1735 (98)
Space heating per m2										(98) / (4) =		45.7435 (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												6078.2605 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	1083.4057	864.0481	749.6760	455.1621	213.0550	0.0000	0.0000	0.0000	0.0000	434.6048	780.0842	1103.1376 (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)	1158.7226	924.1156	801.7925	486.8044	227.8663	0.0000	0.0000	0.0000	0.0000	464.8180	834.3147	1179.8263 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	215.6805	190.0201	199.3710	178.4568	174.6891	155.8142	149.3795	164.2788	164.1024	185.0624	196.0192	210.4015 (64)
Efficiency of water heater (217)m	88.5292	88.3641	88.0206	87.2067	85.3444	79.8000	79.8000	79.8000	79.8000	87.0155	88.1270	79.8000 (216)
Fuel for water heating, kWh/month	243.6263	215.0422	226.5049	204.6366	204.6871	195.2559	187.1924	205.8631	205.6422	212.6775	222.4280	237.4811 (219)
Water heating fuel used												2561.0374 (219)
Annual totals kWh/year												
Space heating fuel - main system												6078.2605 (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)												487.8190 (232)
Total delivered energy for all uses												9202.1169 (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	6078.2605	0.2160	1312.9043 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2561.0374	0.2160	553.1841 (264)
Space and water heating			1866.0883 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	487.8190	0.5190	253.1780 (268)
Total CO2, kg/m2/year			2158.1914 (272)
Emissions per m2 for space and water heating			15.0200 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.0378 (272b)
Emissions per m2 for pumps and fans			0.3133 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.0200 * 1.00) + 2.0378 + 0.3133, rounded to 2 d.p.			17.3700 (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	41.2000 (1b)	x 2.6900 (2b)	= 110.8280 (1b) - (3b)
First floor	60.0800 (1c)	x 2.4300 (2c)	= 145.9944 (1c) - (3c)
Second floor	22.9600 (1d)	x 2.4300 (2d)	= 55.7928 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	124.2400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 312.6152 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
					Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000 / (5) = 0.1280 (8)
Pressure test					Yes
Measured/design AP50					4.0600
Infiltration rate					0.3310 (18)
Number of sides sheltered					1 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3061 (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	0.3903	0.3827	0.3750	0.3367	0.3291	0.2908	0.2908	0.2832	0.3061	0.3291	0.3444	0.3597 (22b)
Effective ac	0.5762	0.5732	0.5703	0.5567	0.5542	0.5423	0.5423	0.5401	0.5469	0.5542	0.5593	0.5647 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Solid Door			2.1200	1.3000	2.7560		(26)
Window (Uw = 1.40)			10.3500	1.3258	13.7216		(27)
French Door (Uw = 1.40)			4.5100	1.3258	5.9792		(27)
Roof Window (Uw = 1.80)			2.5300	1.6791	4.2481		(27a)
150mm EPS B&B			41.2000	0.1700	7.0040	75.0000	3090.0000 (28a)
Timber Floor to Garage			18.8800	0.1900	3.5872	20.0000	377.6000 (28b)
140mm Timber Frame	125.6000	15.6700	109.9300	0.1900	20.8867	9.0000	989.3700 (29a)
Timber Wall to Loft	8.4800		8.4800	0.1900	1.6112	9.0000	76.3200 (29a)
Timber Wall to Garage	14.8000		14.8000	0.1900	2.8120	9.0000	133.2000 (29a)
Wall to Void	22.6400		22.6400	0.1400	3.1696	9.0000	203.7600 (29a)
Dormer Cheek	5.1900	1.3100	3.8800	0.3300	1.2804	9.0000	34.9200 (29a)
Rooflight Stud Wall	4.1800		4.1800	0.3100	1.2958	9.0000	37.6200 (29a)
400mm Mineral Wool	29.9100		29.9100	0.1100	3.2901	9.0000	269.1900 (30)
Sloping	11.1900	0.8400	10.3500	0.2000	2.0700	9.0000	93.1500 (30)
C2V	18.2400		18.2400	0.1400	2.5536	9.0000	164.1600 (30)
Dormer Roof	2.7600		2.7600	0.2800	0.7728	9.0000	24.8400 (30)
Rooflight Sloping	1.8000	1.6900	0.1100	0.3100	0.0341	9.0000	0.9900 (30)
Total net area of external elements Aum(A, m ²)			304.8700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	77.0724		(33)
Timebr Frame			62.1000	0.0000	0.0000	20.0000	1242.0000 (32)
Timber GF			69.8900			9.0000	629.0100 (32c)
Timber FF			117.5200			9.0000	1057.6800 (32c)
Timber 2F			30.4100			9.0000	273.6900 (32c)
Masonry FF			13.3700			39.0000	521.4300 (32c)
Internal Floor			41.2000			18.0000	741.6000 (32d)
Internal Floor 2			22.9600			18.0000	413.2800 (32d)
Internal Ceiling			41.2000			9.0000	370.8000 (32e)
Internal Ceiling 2			22.9600			9.0000	206.6400 (32e)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			10951.2500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							88.1459 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							24.2421 (36)
Total fabric heat loss						(33) + (36) =	101.3145 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	59.4398	59.1347	58.8356	57.4307	57.1678	55.9442	55.9442	55.7176	56.4155	57.1678	57.6996	58.2555 (38)
Heat transfer coeff	160.7543	160.4492	160.1501	158.7452	158.4823	157.2587	157.2587	157.0321	157.7300	158.4823	159.0141	159.5700 (39)
Average = Sum(39)m / 12 =												158.7439 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2939	1.2914	1.2890	1.2777	1.2756	1.2658	1.2658	1.2639	1.2696	1.2756	1.2799	1.2844 (40)
HLP (average)												1.2777 (40)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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 2.8783 (42)
Average daily hot water use (litres/day) 102.5599 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	112.8159	108.7135	104.6111	100.5087	96.4063	92.3039	92.3039	96.4063	100.5087	104.6111	108.7135	112.8159	(44)
Energy content (annual)	167.3028	146.3241	150.9933	131.6396	126.3114	108.9971	101.0018	115.9011	117.2853	136.6847	149.2021	162.0238	(45)
Distribution loss (46)m = 0.15 x (45)m													1613.6671 (45)
Water storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Heat gains from water heating, kWh/month	35.5518	31.0939	32.0861	27.9734	26.8412	23.1619	21.4629	24.6290	24.9231	29.0455	31.7054	34.4301	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts	143.9156	143.9156	143.9156	143.9156	143.9156	143.9156	143.9156	143.9156	143.9156	143.9156	143.9156	143.9156	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.6223	24.5339	19.9523	15.1052	11.2913	9.5326	10.3003	13.3887	17.9703	22.8174	26.6313	28.3900	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	290.6350	293.6509	286.0510	269.8717	249.4481	230.2529	217.4293	214.4134	222.0134	238.1927	258.6162	277.8115	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3916	37.3916	37.3916	37.3916	37.3916	37.3916	37.3916	37.3916	37.3916	37.3916	37.3916	37.3916	(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)	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	(71)
Water heating gains (Table 5)	47.7847	46.2706	43.1265	38.8520	36.0768	32.1693	28.8480	33.1035	34.6155	39.0397	44.0353	46.2770	(72)
Total internal gains	432.2168	430.6302	415.3045	390.0035	362.9910	338.1295	322.7523	327.0803	340.7738	366.2245	395.4576	418.6531	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
North					1.6600	10.6334	0.7200	0.7000	0.7700		6.1652 (74)	
South					8.6900	46.7521	0.7200	0.7000	0.7700		141.9006 (78)	
North					4.5100	10.6334	0.7200	0.7000	0.7700		16.7499 (74)	
North					2.5300	16.1759	0.6300	0.7000	1.0000		16.2431 (82)	

Solar gains	181.0588	306.9507	426.3806	555.8118	659.8088	674.6676	642.0433	559.3101	469.2626	339.9784	216.3519	155.4165 (83)
Total gains	613.2756	737.5809	841.6850	945.8153	1022.7998	1012.7971	964.7956	886.3904	810.0365	706.2029	611.8095	574.0697 (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	18.9234	18.9594	18.9948	19.1629	19.1947	19.3440	19.3440	19.3719	19.2862	19.1947	19.1305	19.0638	
alpha	2.2616	2.2640	2.2663	2.2775	2.2796	2.2896	2.2896	2.2915	2.2857	2.2796	2.2754	2.2709	
util living area	0.9724	0.9574	0.9337	0.8879	0.8094	0.6938	0.5747	0.6224	0.7904	0.9117	0.9605	0.9761	(86)
MIT	17.9313	18.2393	18.7385	19.4023	20.0445	20.5491	20.7959	20.7465	20.3358	19.5145	18.6036	17.8734	(87)
Th 2	19.8456	19.8475	19.8494	19.8583	19.8600	19.8677	19.8677	19.8692	19.8648	19.8600	19.8566	19.8531	(88)
util rest of house	0.9682	0.9510	0.9230	0.8682	0.7718	0.6236	0.4653	0.5174	0.7348	0.8923	0.9534	0.9725	(89)
MIT 2	17.0458	17.3517	17.8459	18.5009	19.1147	19.5756	19.7713	19.7412	19.3992	18.6214	17.7223	16.9933	(90)
Living area fraction									fLA = Living area / (4) =			0.0691	(91)
MIT	17.1070	17.4131	17.9076	18.5632	19.1790	19.6429	19.8422	19.8107	19.4639	18.6831	17.7832	17.0542	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.1070	17.4131	17.9076	18.5632	19.1790	19.6429	19.8422	19.8107	19.4639	18.6831	17.7832	17.0542	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9537	0.9319	0.8988	0.8397	0.7445	0.6075	0.4625	0.5111	0.7106	0.8655	0.9351	0.9594	(94)
Useful gains	584.8944	687.3197	756.5339	794.1864	761.4961	615.2269	446.2352	453.0457	575.6447	611.1971	572.0801	550.7738	(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													

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Month fracti	2058.7866	2007.7185	1826.9351	1533.9933	1185.2927	793.0470	509.8612	535.5897	846.0535	1281.0361	1698.7870	2051.1382 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating	1096.5758	887.3080	796.3785	532.6610	315.3047	0.0000	0.0000	0.0000	0.0000	498.3602	811.2290	1116.2711 (98)
Space heating per m2												6054.0882 (98)
											(98) / (4) =	48.7290 (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												
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	1478.2319	1163.7145	1193.4441	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.6425	0.7113	0.6782	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	949.7583	827.7124	809.3811	0.0000	0.0000	0.0000	0.0000 (102)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1272.7934	1216.3964	1133.9269	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	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	0.0000	0.0000	0.0000	0.0000	0.0000	232.5853	289.1809	241.4621	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction												763.2283 (104)
Intermittency factor (Table 10b)												1.0000 (105)
Space cooling kWh	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	0.0000	0.0000	0.0000	0.0000	0.0000	58.1463	72.2952	60.3655	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling per m2												190.8071 (107)
Energy for space heating												1.5358 (108)
Energy for space cooling												48.7290 (99)
Total												1.5358 (108)
Dwelling Fabric Energy Efficiency (DFEE)												50.2648 (109)
												50.3 (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	41.2000 (1b)	x 2.6900 (2b)	= 110.8280 (1b) - (3b)
First floor	60.0800 (1c)	x 2.4300 (2c)	= 145.9944 (1c) - (3c)
Second floor	22.9600 (1d)	x 2.4300 (2d)	= 55.7928 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	124.2400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 312.6152 (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) = 0.1280 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3780 (18)
Number of sides sheltered					1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3496 (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	0.4457	0.4370	0.4283	0.3846	0.3758	0.3321	0.3321	0.3234	0.3496	0.3758	0.3933	0.4108 (22b)
Effective ac	0.5993	0.5955	0.5917	0.5739	0.5706	0.5552	0.5552	0.5523	0.5611	0.5706	0.5773	0.5844 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.40)			14.8600	1.3258	19.7008		(27)
TER Room Window (Uw = 1.70)			2.5300	1.5918	4.0272		(27a)
150mm EPS B&B			41.2000	0.1300	5.3560		(28a)
Timber Floor to Garage			18.8800	0.1300	2.4544		(28b)
140mm Timber Frame	125.6000	15.6700	109.9300	0.1800	19.7874		(29a)
Timber Wall to Loft	8.4800		8.4800	0.1800	1.5264		(29a)
Timber Wall to Garage	14.8000		14.8000	0.1800	2.6640		(29a)
Wall to Void	22.6400		22.6400	0.1800	4.0752		(29a)
Dormer Cheek	5.1900	1.3100	3.8800	0.1800	0.6984		(29a)
Rooflight Stud Wall	4.1800		4.1800	0.1800	0.7524		(29a)
400mm Mineral Wool	29.9100		29.9100	0.1300	3.8883		(30)
Sloping	11.1900	0.8400	10.3500	0.1300	1.3455		(30)
C2V	18.2400		18.2400	0.1300	2.3712		(30)
Dormer Roof	2.7600		2.7600	0.1300	0.3588		(30)
Rooflight Sloping	1.8000	1.6900	0.1100	0.1300	0.0143		(30)
Total net area of external elements Aum(A, m ²)			304.8700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	71.1402		(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)							21.1352 (36)
Total fabric heat loss						(33) + (36) =	92.2754 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 61.8303	Feb 61.4323	Mar 61.0422	Apr 59.2100	May 58.8672	Jun 57.2713	Jul 57.2713	Aug 56.9758	Sep 57.8860	Oct 58.8672	Nov 59.5607	Dec 60.2857 (38)
Heat transfer coeff	154.1057	153.7077	153.3177	151.4854	151.1426	149.5468	149.5468	149.2512	150.1614	151.1426	151.8361	152.5611 (39)
Average = Sum(39)m / 12 =												151.4838 (39)

HLP	Jan 1.2404	Feb 1.2372	Mar 1.2340	Apr 1.2193	May 1.2165	Jun 1.2037	Jul 1.2037	Aug 1.2013	Sep 1.2086	Oct 1.2165	Nov 1.2221	Dec 1.2280 (40)
HLP (average)												1.2193 (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	2.8783 (42)
Average daily hot water use (litres/day)	102.5599 (43)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	112.8159	108.7135	104.6111	100.5087	96.4063	92.3039	92.3039	96.4063	100.5087	104.6111	108.7135	112.8159	(44)
Energy conte	167.3028	146.3241	150.9933	131.6396	126.3114	108.9971	101.0018	115.9011	117.2853	136.6847	149.2021	162.0238	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Heat gains from water heating, kWh/month	35.5518	31.0939	32.0861	27.9734	26.8412	23.1619	21.4629	24.6290	24.9231	29.0455	31.7054	34.4301	(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	143.9156	143.9156	143.9156	143.9156	143.9156	143.9156	143.9156	143.9156	143.9156	143.9156	143.9156	143.9156	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.6223	24.5339	19.9523	15.1052	11.2913	9.5326	10.3003	13.3887	17.9703	22.8174	26.6313	28.3900	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	290.6350	293.6509	286.0510	269.8717	249.4481	230.2529	217.4293	214.4134	222.0134	238.1927	258.6162	277.8115	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3916	37.3916	37.3916	37.3916	37.3916	37.3916	37.3916	37.3916	37.3916	37.3916	37.3916	37.3916	(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)	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	(71)
Water heating gains (Table 5)	47.7847	46.2706	43.1265	38.8520	36.0768	32.1693	28.8480	33.1035	34.6155	39.0397	44.0353	46.2770	(72)
Total internal gains	432.2168	430.6302	415.3045	390.0035	362.9910	338.1295	322.7523	327.0803	340.7738	366.2245	395.4576	418.6531	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W		
North				6.1700	10.6334		0.6300	0.7000	0.7700		20.0507 (74)		
South				8.6900	46.7521		0.6300	0.7000	0.7700		124.1631 (78)		
North				2.5300	16.1759		0.6300	0.7000	1.0000		16.2431 (82)		

Solar gains	160.4569	272.4271	380.0749	499.0484	596.1005	611.1800	580.9479	503.5539	419.4240	302.1296	191.7933	137.7017	(83)
Total gains	592.6736	703.0573	795.3794	889.0519	959.0914	949.3095	903.7002	830.6342	760.1978	668.3541	587.2508	556.3549	(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)														
tau	55.9861	56.1311	56.2739	56.9545	57.0837	57.6928	57.6928	57.8071	57.4567	57.0837	56.8230	56.5529		
alpha	4.7324	4.7421	4.7516	4.7970	4.8056	4.8462	4.8462	4.8538	4.8304	4.8056	4.7882	4.7702		
util living area	0.9993	0.9982	0.9951	0.9837	0.9432	0.8323	0.6777	0.7419	0.9286	0.9905	0.9984	0.9995	(86)	
MIT	19.5265	19.6808	19.9341	20.2846	20.6258	20.8750	20.9659	20.9474	20.7530	20.3204	19.8628	19.5041	(87)	
Th 2	19.8878	19.8904	19.8929	19.9046	19.9068	19.9170	19.9170	19.9189	19.9131	19.9068	19.9023	19.8977	(88)	
util rest of house	0.9990	0.9975	0.9932	0.9765	0.9150	0.7483	0.5350	0.6053	0.8803	0.9851	0.9977	0.9993	(89)	
MIT 2	18.5417	18.6977	18.9522	19.3082	19.6358	19.8536	19.9076	19.9022	19.7608	19.3479	18.8892	18.5271	(90)	
Living area fraction									fLA =	Living area / (4) =			0.0691	(91)
MIT	18.6098	18.7657	19.0201	19.3757	19.7043	19.9242	19.9808	19.9744	19.8294	19.4152	18.9565	18.5946	(92)	
Temperature adjustment												0.0000		
adjusted MIT	18.6098	18.7657	19.0201	19.3757	19.7043	19.9242	19.9808	19.9744	19.8294	19.4152	18.9565	18.5946	(93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9985	0.9965	0.9910	0.9717	0.9083	0.7489	0.5442	0.6133	0.8754	0.9816	0.9968	0.9989	(94)
Useful gains	591.8094	700.6032	788.2530	863.9061	871.1348	710.9669	491.7733	509.4356	665.5015	656.0307	585.3951	555.7603	(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	2205.2199	2131.2586	1919.5564	1586.9220	1209.7858	796.2148	505.5845	533.4891	860.3303	1332.3499	1800.2404	2196.0622	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	1200.3774	961.4004	841.6897	520.5715	251.9563	0.0000	0.0000	0.0000	0.0000	503.1815	874.6886	1220.3846	(98)
Space heating												6374.2501	(98)
Space heating per m2												51.3059	(99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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	1405.7395	1106.6460	1134.3094	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7569	0.8428	0.8036	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1064.0361	932.6263	911.5153	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1198.5871	1144.9862	1068.7574	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	96.8767	157.9957	116.9881	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling													
Cooled fraction									fC = cooled area / (4) =			371.8605	(104)
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	(105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	24.2192	39.4989	29.2470	0.0000	0.0000	0.0000	0.0000	(106)
Space cooling													
Space cooling per m2													(107)
Energy for space heating													92.9651 (107)
Energy for space cooling													0.7483 (108)
Total													51.3059 (99)
Target Fabric Energy Efficiency (TFEE)													0.7483 (108)
													52.0542 (109)
													59.9 (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	41.2000 (1b)	x 2.6900 (2b)	= 110.8280 (1b) - (3b)
First floor	60.0800 (1c)	x 2.4300 (2c)	= 145.9944 (1c) - (3c)
Second floor	22.9600 (1d)	x 2.4300 (2d)	= 55.7928 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	124.2400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 312.6152 (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					4.0600
Infiltration rate					0.2030 (18)
Number of sides sheltered					1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1878 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	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	0.2066	0.1925	0.1925	0.1831	0.1831	0.1737	0.1737	0.1643	0.1643	0.1784	0.1737	0.1831 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K						
Solid Door			2.1200	1.3000	2.7560			(26)					
Window (Uw = 1.40)			10.3500	1.3258	13.7216			(27)					
French Door (Uw = 1.40)			4.5100	1.3258	5.9792			(27)					
Roof Window (Uw = 1.80)			2.5300	1.6791	4.2481			(27a)					
150mm EPS B&B			41.2000	0.1700	7.0040	75.0000	3090.0000	(28a)					
Timber Floor to Garage			18.8800	0.1900	3.5872	20.0000	377.6000	(28b)					
140mm Timber Frame	125.6000	15.6700	109.9300	0.1900	20.8867	9.0000	989.3700	(29a)					
Timber Wall to Loft	8.4800		8.4800	0.1900	1.6112	9.0000	76.3200	(29a)					
Timber Wall to Garage	14.8000		14.8000	0.1900	2.8120	9.0000	133.2000	(29a)					
Wall to Void	22.6400		22.6400	0.1400	3.1696	9.0000	203.7600	(29a)					
Dormer Cheek	5.1900	1.3100	3.8800	0.3300	1.2804	9.0000	34.9200	(29a)					
Rooflight Stud Wall	4.1800		4.1800	0.3100	1.2958	9.0000	37.6200	(29a)					
400mm Mineral Wool	29.9100		29.9100	0.1100	3.2901	9.0000	269.1900	(30)					
Sloping	11.1900	0.8400	10.3500	0.2000	2.0700	9.0000	93.1500	(30)					
C2V	18.2400		18.2400	0.1400	2.5536	9.0000	164.1600	(30)					
Dormer Roof	2.7600		2.7600	0.2800	0.7728	9.0000	24.8400	(30)					
Rooflight Sloping	1.8000	1.6900	0.1100	0.3100	0.0341	9.0000	0.9900	(30)					
Total net area of external elements Aum(A, m ²)			304.8700					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	77.0724			(33)					
Timebr Frame			62.1000	0.0000	0.0000	20.0000	1242.0000	(32)					
Timber GF			69.8900			9.0000	629.0100	(32c)					
Timber FF			117.5200			9.0000	1057.6800	(32c)					
Timber 2F			30.4100			9.0000	273.6900	(32c)					
Masonry FF			13.3700			39.0000	521.4300	(32c)					
Internal Floor			41.2000			18.0000	741.6000	(32d)					
Internal Floor 2			22.9600			18.0000	413.2800	(32d)					
Internal Ceiling			41.2000			18.0000	741.6000	(32e)					
Internal Ceiling 2			22.9600			18.0000	413.2800	(32e)					
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			11528.6900	(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							92.7937	(35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							24.2421	(36)					
Total fabric heat loss						(33) + (36) =	101.3145	(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	
	51.5815	51.5815	51.5815	51.5815	51.5815	51.5815	51.5815	51.5815	51.5815	51.5815	51.5815	51.5815	(38)
Heat transfer coeff	152.8960	152.8960	152.8960	152.8960	152.8960	152.8960	152.8960	152.8960	152.8960	152.8960	152.8960	152.8960	(39)
Average = Sum(39)m / 12 =												152.8960	(39)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2307	1.2307	1.2307	1.2307	1.2307	1.2307	1.2307	1.2307	1.2307	1.2307	1.2307	1.2307 (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												2.8783 (42)
Average daily hot water use (litres/day)												102.5599 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	112.8159	108.7135	104.6111	100.5087	96.4063	92.3039	92.3039	96.4063	100.5087	104.6111	108.7135	112.8159 (44)
Energy content (annual)	167.3028	146.3241	150.9933	131.6396	126.3114	108.9971	101.0018	115.9011	117.2853	136.6847	149.2021	162.0238 (45)
Energy content (annual)												1613.6671 (45)
Distribution loss (46)m = 0.15 x (45)m	25.0954	21.9486	22.6490	19.7459	18.9467	16.3496	15.1503	17.3852	17.5928	20.5027	22.3803	24.3036 (46)
Water storage loss:												170.0000 (47)
Store volume												1.2000 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.6480 (55)
Enter (49) or (54) in (55)												
Total storage loss	20.0880	18.1440	20.0880	19.4400	20.0880	19.4400	20.0880	20.0880	19.4400	20.0880	19.4400	20.0880 (56)
If cylinder contains dedicated solar storage	20.0880	18.1440	20.0880	19.4400	20.0880	19.4400	20.0880	20.0880	19.4400	20.0880	19.4400	20.0880 (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	210.6532	185.4793	194.3437	173.5916	169.6618	150.9491	144.3522	159.2515	159.2373	180.0351	191.1541	205.3742 (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	210.6532	185.4793	194.3437	173.5916	169.6618	150.9491	144.3522	159.2515	159.2373	180.0351	191.1541	205.3742 (64)
Total per year (kWh/year) = Sum (64)m =												2124.0831 (64)
RHI water heating demand												2124 (64)
Heat gains from water heating, kWh/month	90.3085	79.9769	84.8856	77.3318	76.6789	69.8031	68.2634	73.2174	72.5590	80.1280	83.1713	88.5532 (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	172.6988	172.6988	172.6988	172.6988	172.6988	172.6988	172.6988	172.6988	172.6988	172.6988	172.6988	172.6988 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.0558	61.3348	49.8808	37.7630	28.2283	23.8315	25.7508	33.4718	44.9258	57.0436	66.5783	70.9751 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	433.7836	438.2850	426.9418	402.7935	372.3107	343.6611	324.5214	320.0201	331.3632	355.5115	385.9944	414.6440 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.1482	55.1482	55.1482	55.1482	55.1482	55.1482	55.1482	55.1482	55.1482	55.1482	55.1482	55.1482 (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)	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325 (71)
Water heating gains (Table 5)	121.3824	119.0133	114.0935	107.4053	103.0630	96.9488	91.7519	98.4105	100.7763	107.6989	115.5157	119.0232 (72)
Total internal gains	739.9363	734.3474	706.6306	663.6762	619.3163	580.1558	557.7385	567.6169	592.7798	635.9685	683.8028	720.3567 (73)

6. Solar gains

[Jan]												Gains
	Area				Solar flux		g		FF		Access	
	m2				Table 6a		Specific data		Specific data		factor	W
					W/m2		or Table 6b		or Table 6c		Table 6d	
North	1.6600				13.4839		0.7200		0.7000		0.7700	7.8178 (74)
South	8.6900				56.7559		0.7200		0.7000		0.7700	172.2639 (78)
North	4.5100				13.4839		0.7200		0.7000		0.7700	21.2401 (74)
North	2.5300				20.3432		0.6300		0.7000		1.0000	20.4278 (82)

Solar gains	221.7496	320.9359	453.4611	602.6519	682.5255	767.3439	703.7217	635.7129	525.9253	379.6891	264.2758	180.1069 (83)
Total gains	961.6859	1055.2833	1160.0917	1266.3281	1301.8419	1347.4997	1261.4603	1203.3297	1118.7052	1015.6576	948.0786	900.4636 (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)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	20.9450	20.9450	20.9450	20.9450	20.9450	20.9450	20.9450	20.9450	20.9450	20.9450	20.9450	20.9450
util living area	2.3963	2.3963	2.3963	2.3963	2.3963	2.3963	2.3963	2.3963	2.3963	2.3963	2.3963	2.3963
	0.9291	0.9106	0.8702	0.7977	0.6787	0.5008	0.3720	0.3873	0.6135	0.8034	0.8979	0.9366 (86)
MIT	18.8214	19.0315	19.4821	20.0189	20.5263	20.8467	20.9485	20.9438	20.7296	20.1820	19.4297	18.7706 (87)
Th 2	19.8956	19.8956	19.8956	19.8956	19.8956	19.8956	19.8956	19.8956	19.8956	19.8956	19.8956	19.8956 (88)
util rest of house	0.9187	0.8976	0.8506	0.7654	0.6227	0.4134	0.2578	0.2694	0.5316	0.7637	0.8804	0.9271 (89)
MIT 2	17.0445	17.3443	17.9849	18.7324	19.4071	19.7804	19.8732	19.8709	19.6646	18.9725	17.9212	16.9731 (90)
Living area fraction												fLA = Living area / (4) = 0.0691 (91)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF HEAT DEMAND 09 Jan 2014

MIT	17.1673	17.4609	18.0884	18.8213	19.4845	19.8541	19.9476	19.9451	19.7382	19.0561	18.0255	17.0974 (92)
Temperature adjustment												-0.1500
adjusted MIT	17.0173	17.3109	17.9384	18.6713	19.3345	19.7041	19.7976	19.7951	19.5882	18.9061	17.8755	16.9474 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8796	0.8553	0.8050	0.7216	0.5899	0.3969	0.2470	0.2579	0.5055	0.7192	0.8361	0.8897 (94)	
Useful gains	845.9093	902.6085	933.9242	913.7558	768.0151	534.7887	311.6397	310.3651	565.5427	730.4115	792.6501	801.1493 (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													
1776.2412	1744.6884	1580.7060	1325.8106	953.2232	581.6367	320.7102	320.3349	655.6479	1055.9187	1448.7697	1750.2566 (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													
692.1669	565.8776	481.2056	296.6795	137.7948	0.0000	0.0000	0.0000	0.0000	242.1773	472.4061	706.1358 (98)		
Space heating												3594.4436 (98)	
RHI space heating demand												3594 (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	41.2000 (1b)	x 2.6900 (2b)	= 110.8280 (1b) - (3b)
First floor	60.0800 (1c)	x 2.4300 (2c)	= 145.9944 (1c) - (3c)
Second floor	22.9600 (1d)	x 2.4300 (2d)	= 55.7928 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	124.2400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 312.6152 (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							4.0600					
Infiltration rate							0.2030	(18)				
Number of sides sheltered							1	(19)				
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.9250 (20)				
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1878 (21)				
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.2394	0.2347	0.2300	0.2066	0.2019	0.1784	0.1784	0.1737	0.1878	0.2019	0.2112	0.2206 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K						
Solid Door			2.1200	1.3000	2.7560			(26)					
Window (Uw = 1.40)			10.3500	1.3258	13.7216			(27)					
French Door (Uw = 1.40)			4.5100	1.3258	5.9792			(27)					
Roof Window (Uw = 1.80)			2.5300	1.6791	4.2481			(27a)					
150mm EPS B&B			41.2000	0.1700	7.0040	75.0000	3090.0000	(28a)					
Timber Floor to Garage			18.8800	0.1900	3.5872	20.0000	377.6000	(28b)					
140mm Timber Frame	125.6000	15.6700	109.9300	0.1900	20.8867	9.0000	989.3700	(29a)					
Timber Wall to Loft	8.4800		8.4800	0.1900	1.6112	9.0000	76.3200	(29a)					
Timber Wall to Garage	14.8000		14.8000	0.1900	2.8120	9.0000	133.2000	(29a)					
Wall to Void	22.6400		22.6400	0.1400	3.1696	9.0000	203.7600	(29a)					
Dormer Cheek	5.1900	1.3100	3.8800	0.3300	1.2804	9.0000	34.9200	(29a)					
Rooflight Stud Wall	4.1800		4.1800	0.3100	1.2958	9.0000	37.6200	(29a)					
400mm Mineral Wool	29.9100		29.9100	0.1100	3.2901	9.0000	269.1900	(30)					
Sloping	11.1900	0.8400	10.3500	0.2000	2.0700	9.0000	93.1500	(30)					
C2V	18.2400		18.2400	0.1400	2.5536	9.0000	164.1600	(30)					
Dormer Roof	2.7600		2.7600	0.2800	0.7728	9.0000	24.8400	(30)					
Rooflight Sloping	1.8000	1.6900	0.1100	0.3100	0.0341	9.0000	0.9900	(30)					
Total net area of external elements Aum(A, m2)			304.8700					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	77.0724			(33)					
Timebr Frame			62.1000	0.0000	0.0000	20.0000	1242.0000	(32)					
Timber GF			69.8900			9.0000	629.0100	(32c)					
Timber FF			117.5200			9.0000	1057.6800	(32c)					
Timber 2F			30.4100			9.0000	273.6900	(32c)					
Masonry FF			13.3700			39.0000	521.4300	(32c)					
Internal Floor			41.2000			18.0000	741.6000	(32d)					
Internal Floor 2			22.9600			18.0000	413.2800	(32d)					
Internal Ceiling			41.2000			18.0000	741.6000	(32e)					
Internal Ceiling 2			22.9600			18.0000	413.2800	(32e)					
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			11528.6900	(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							92.7937	(35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							24.2421	(36)					
Total fabric heat loss						(33) + (36) =	101.3145	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 51.5815	Feb 51.5815	Mar 51.5815	Apr 51.5815	May 51.5815	Jun 51.5815	Jul 51.5815	Aug 51.5815	Sep 51.5815	Oct 51.5815	Nov 51.5815	Dec 51.5815	(38)
Heat transfer coeff	152.8960	152.8960	152.8960	152.8960	152.8960	152.8960	152.8960	152.8960	152.8960	152.8960	152.8960	152.8960	(39)
Average = Sum(39)m / 12 =												152.8960	(39)

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	Jan 1.2307	Feb 1.2307	Mar 1.2307	Apr 1.2307	May 1.2307	Jun 1.2307	Jul 1.2307	Aug 1.2307	Sep 1.2307	Oct 1.2307	Nov 1.2307	Dec 1.2307 (40) 1.2307 (40)
HLP												
HLP (average)												
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												2.8783 (42)
Average daily hot water use (litres/day)												102.5599 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	112.8159	108.7135	104.6111	100.5087	96.4063	92.3039	92.3039	96.4063	100.5087	104.6111	108.7135	112.8159 (44)
Energy content (annual)	167.3028	146.3241	150.9933	131.6396	126.3114	108.9971	101.0018	115.9011	117.2853	136.6847	149.2021	162.0238 (45)
Energy content (annual)												1613.6671 (45)
Distribution loss (46)m = 0.15 x (45)m	25.0954	21.9486	22.6490	19.7459	18.9467	16.3496	15.1503	17.3852	17.5928	20.5027	22.3803	24.3036 (46)
Water storage loss:												
Store volume												170.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.2000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.6480 (55)
Total storage loss	20.0880	18.1440	20.0880	19.4400	20.0880	19.4400	20.0880	20.0880	19.4400	20.0880	19.4400	20.0880 (56)
If cylinder contains dedicated solar storage	20.0880	18.1440	20.0880	19.4400	20.0880	19.4400	20.0880	20.0880	19.4400	20.0880	19.4400	20.0880 (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	210.6532	185.4793	194.3437	173.5916	169.6618	150.9491	144.3522	159.2515	159.2373	180.0351	191.1541	205.3742 (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	210.6532	185.4793	194.3437	173.5916	169.6618	150.9491	144.3522	159.2515	159.2373	180.0351	191.1541	205.3742 (64)
Total per year (kWh/year) = Sum (64)m =												2124.0831 (64)
Heat gains from water heating, kWh/month	90.3085	79.9769	84.8856	77.3318	76.6789	69.8031	68.2634	73.2174	72.5590	80.1280	83.1713	88.5532 (65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabolic gains (Table 5), Watts	172.6988	172.6988	172.6988	172.6988	172.6988	172.6988	172.6988	172.6988	172.6988	172.6988	172.6988	172.6988 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.0558	61.3348	49.8808	37.7630	28.2283	23.8315	25.7508	33.4718	44.9258	57.0436	66.5783	70.9751 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	433.7836	438.2850	426.9418	402.7935	372.3107	343.6611	324.5214	320.0201	331.3632	355.5115	385.9944	414.6440 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.1482	55.1482	55.1482	55.1482	55.1482	55.1482	55.1482	55.1482	55.1482	55.1482	55.1482	55.1482 (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)	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325 (71)
Water heating gains (Table 5)	121.3824	119.0133	114.0935	107.4053	103.0630	96.9488	91.7519	98.4105	100.7763	107.6989	115.5157	119.0232 (72)
Total internal gains	739.9363	734.3474	706.6306	663.6762	619.3163	580.1558	557.7385	567.6169	592.7798	635.9685	683.8028	720.3567 (73)

6. Solar gains

[Jan]			Area m2		Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
North			1.6600		10.6334		0.7200		0.7000		0.7700		6.1652 (74)
South			8.6900		46.7521		0.7200		0.7000		0.7700		141.9006 (78)
North			4.5100		10.6334		0.7200		0.7000		0.7700		16.7499 (74)
North			2.5300		16.1759		0.6300		0.7000		1.0000		16.2431 (82)
Solar gains	181.0588	306.9507	426.3806	555.8118	659.8088	674.6676	642.0433	559.3101	469.2626	339.9784	216.3519	155.4165	(83)
Total gains	920.9951	1041.2981	1133.0111	1219.4880	1279.1251	1254.8235	1199.7819	1126.9269	1062.0425	975.9469	900.1547	875.7732	(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	20.9450	20.9450	20.9450	20.9450	20.9450	20.9450	20.9450	20.9450	20.9450	20.9450	20.9450	20.9450
alpha	2.3963	2.3963	2.3963	2.3963	2.3963	2.3963	2.3963	2.3963	2.3963	2.3963	2.3963	2.3963
util living area	0.9427	0.9224	0.8910	0.8342	0.7419	0.6139	0.4891	0.5292	0.7032	0.8519	0.9222	0.9487 (86)
MIT	18.5388	18.8076	19.2364	19.7838	20.3093	20.6960	20.8745	20.8437	20.5500	19.8919	19.1085	18.4619 (87)
Th 2	19.8956	19.8956	19.8956	19.8956	19.8956	19.8956	19.8956	19.8956	19.8956	19.8956	19.8956	19.8956 (88)
util rest of house	0.9346	0.9116	0.8751	0.8084	0.6983	0.5418	0.3878	0.4289	0.6394	0.8235	0.9095	0.9414 (89)
MIT 2	16.6361	17.0216	17.6354	18.4080	19.1257	19.6178	19.8130	19.7863	19.4527	18.5744	17.4619	16.5257 (90)
Living area fraction									fLA = Living area / (4) =			0.0691 (91)
MIT	16.7677	17.1451	17.7461	18.5032	19.2075	19.6923	19.8864	19.8594	19.5286	18.6655	17.5757	16.6595 (92)

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Temperature adjustment
adjusted MIT 16.6177 16.9951 17.5961 18.3532 19.0575 19.5423 19.7364 19.7094 19.3786 18.5155 17.4257 -0.1500
16.5095 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8991	0.8714	0.8308	0.7628	0.6591	0.5157	0.3718	0.4101	0.6041	0.7770	0.8687	0.9076 (94)
Useful gains	828.0486	907.3725	941.3269	930.2473	843.0096	647.1114	446.0869	462.1847	641.5769	758.3450	781.9447	794.8846 (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	1883.3252	1849.2935	1696.5524	1445.3508	1124.9379	755.6647	479.5476	505.9954	807.0739	1210.2520	1578.7619	1882.0798 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	785.1258	632.9709	561.8878	370.8745	209.7547	0.0000	0.0000	0.0000	0.0000	336.2188	573.7084	808.8732 (98)
Space heating												4279.4141 (98)
Space heating per m2												(98) / (4) = 34.4447 (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 4723.4151 (211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	785.1258	632.9709	561.8878	370.8745	209.7547	0.0000	0.0000	0.0000	0.0000	336.2188	573.7084	808.8732 (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)	866.5848	698.6434	620.1852	409.3537	231.5173	0.0000	0.0000	0.0000	0.0000	371.1025	633.2322	892.7960 (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	210.6532	185.4793	194.3437	173.5916	169.6618	150.9491	144.3522	159.2515	159.2373	180.0351	191.1541	205.3742 (64)
Efficiency of water heater (217)m	88.1040	87.9314	87.5857	86.8901	85.4811	79.9000	79.9000	79.9000	79.9000	86.5576	87.6659	79.9000 (216)
Fuel for water heating, kWh/month	239.0959	210.9363	221.8898	199.7830	198.4786	188.9225	180.6661	199.3135	199.2958	207.9945	218.0483	232.8292 (219)
Water heating fuel used												2497.2537 (219)
Annual totals kWh/year												
Space heating fuel - main system												4723.4151 (211)
Space heating fuel - secondary												0.0000 (215)

Electricity for pumps and fans:
 (MEVDecentralised, Database: total watage = 10.3610, total flow = 45.0000, SFP = 0.2302)
 mechanical ventilation fans (SFP = 0.2302) 87.8131 (230a)
 central heating pump 30.0000 (230c)
 main heating flue fan 45.0000 (230e)
 Total electricity for the above, kWh/year 162.8131 (231)
 Electricity for lighting (calculated in Appendix L) 487.8190 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
 PV Unit 0 (0.80 * 0.66 * 1080 * 1.00) = -569.9890 -569.9890 (233)
 Total delivered energy for all uses 7301.3118 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	4723.4151	3.4800	164.3748 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2497.2537	3.4800	86.9044 (247)
Mechanical ventilation fans	87.8131	13.1900	11.5825 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	487.8190	13.1900	64.3433 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-569.9890	13.1900	-75.1815 (252)
Total energy cost			381.9161 (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] = 0.9478 (257)
 SAP value 86.7783
 SAP rating (Section 12) 87 (258)
 SAP band B

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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	4723.4151	0.2160	1020.2577 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2497.2537	0.2160	539.4068 (264)
Space and water heating			1559.6645 (265)
Pumps and fans	162.8131	0.5190	84.5000 (267)
Energy for lighting	487.8190	0.5190	253.1780 (268)
Energy saving/generation technologies			
PV Unit	-569.9890	0.5190	-295.8243 (269)
Total kg/year			1601.5182 (272)
CO2 emissions per m2			12.8900 (273)
EI value			87.3196
EI rating			87 (274)
EI band			B

Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9060 = 3.841$, 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	$3.48 / 0.8484 = 4.102$, stars = 4
Water heating environmental impact	$0.216 / 0.8484 = 0.2546$, stars = 4

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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	41.2000 (1b)	x 2.6900 (2b)	= 110.8280 (1b) - (3b)
First floor	60.0800 (1c)	x 2.4300 (2c)	= 145.9944 (1c) - (3c)
Second floor	22.9600 (1d)	x 2.4300 (2d)	= 55.7928 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	124.2400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 312.6152 (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							4.0600					
Infiltration rate							0.2030	(18)				
Number of sides sheltered							1	(19)				
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.9250 (20)				
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1878 (21)				
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	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												
	0.2066	0.1925	0.1925	0.1831	0.1831	0.1737	0.1737	0.1643	0.1643	0.1784	0.1737	0.1831 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K						
Solid Door			2.1200	1.3000	2.7560			(26)					
Window (Uw = 1.40)			10.3500	1.3258	13.7216			(27)					
French Door (Uw = 1.40)			4.5100	1.3258	5.9792			(27)					
Roof Window (Uw = 1.80)			2.5300	1.6791	4.2481			(27a)					
150mm EPS B&B			41.2000	0.1700	7.0040	75.0000	3090.0000	(28a)					
Timber Floor to Garage			18.8800	0.1900	3.5872	20.0000	377.6000	(28b)					
140mm Timber Frame	125.6000	15.6700	109.9300	0.1900	20.8867	9.0000	989.3700	(29a)					
Timber Wall to Loft	8.4800		8.4800	0.1900	1.6112	9.0000	76.3200	(29a)					
Timber Wall to Garage	14.8000		14.8000	0.1900	2.8120	9.0000	133.2000	(29a)					
Wall to Void	22.6400		22.6400	0.1400	3.1696	9.0000	203.7600	(29a)					
Dormer Cheek	5.1900	1.3100	3.8800	0.3300	1.2804	9.0000	34.9200	(29a)					
Rooflight Stud Wall	4.1800		4.1800	0.3100	1.2958	9.0000	37.6200	(29a)					
400mm Mineral Wool	29.9100		29.9100	0.1100	3.2901	9.0000	269.1900	(30)					
Sloping	11.1900	0.8400	10.3500	0.2000	2.0700	9.0000	93.1500	(30)					
C2V	18.2400		18.2400	0.1400	2.5536	9.0000	164.1600	(30)					
Dormer Roof	2.7600		2.7600	0.2800	0.7728	9.0000	24.8400	(30)					
Rooflight Sloping	1.8000	1.6900	0.1100	0.3100	0.0341	9.0000	0.9900	(30)					
Total net area of external elements Aum(A, m2)			304.8700					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	77.0724			(33)					
Timebr Frame			62.1000	0.0000	0.0000	20.0000	1242.0000	(32)					
Timber GF			69.8900			9.0000	629.0100	(32c)					
Timber FF			117.5200			9.0000	1057.6800	(32c)					
Timber 2F			30.4100			9.0000	273.6900	(32c)					
Masonry FF			13.3700			39.0000	521.4300	(32c)					
Internal Floor			41.2000			18.0000	741.6000	(32d)					
Internal Floor 2			22.9600			18.0000	413.2800	(32d)					
Internal Ceiling			41.2000			18.0000	741.6000	(32e)					
Internal Ceiling 2			22.9600			18.0000	413.2800	(32e)					
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			11528.6900	(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							92.7937	(35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							24.2421	(36)					
Total fabric heat loss						(33) + (36) =	101.3145	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 51.5815	Feb 51.5815	Mar 51.5815	Apr 51.5815	May 51.5815	Jun 51.5815	Jul 51.5815	Aug 51.5815	Sep 51.5815	Oct 51.5815	Nov 51.5815	Dec 51.5815	(38)
Heat transfer coeff	152.8960	152.8960	152.8960	152.8960	152.8960	152.8960	152.8960	152.8960	152.8960	152.8960	152.8960	152.8960	(39)
Average = Sum(39)m / 12 =												152.8960	(39)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

	Jan 1.2307	Feb 1.2307	Mar 1.2307	Apr 1.2307	May 1.2307	Jun 1.2307	Jul 1.2307	Aug 1.2307	Sep 1.2307	Oct 1.2307	Nov 1.2307	Dec 1.2307 (40) 1.2307 (40)
HLP												
HLP (average)												
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												2.8783 (42)
Average daily hot water use (litres/day)												102.5599 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	112.8159	108.7135	104.6111	100.5087	96.4063	92.3039	92.3039	96.4063	100.5087	104.6111	108.7135	112.8159 (44)
Energy content (annual)	167.3028	146.3241	150.9933	131.6396	126.3114	108.9971	101.0018	115.9011	117.2853	136.6847	149.2021	162.0238 (45)
Energy content (annual)												1613.6671 (45)
Distribution loss (46)m = 0.15 x (45)m	25.0954	21.9486	22.6490	19.7459	18.9467	16.3496	15.1503	17.3852	17.5928	20.5027	22.3803	24.3036 (46)
Water storage loss:												
Store volume												170.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.2000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.6480 (55)
Total storage loss	20.0880	18.1440	20.0880	19.4400	20.0880	19.4400	20.0880	20.0880	19.4400	20.0880	19.4400	20.0880 (56)
If cylinder contains dedicated solar storage	20.0880	18.1440	20.0880	19.4400	20.0880	19.4400	20.0880	20.0880	19.4400	20.0880	19.4400	20.0880 (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	210.6532	185.4793	194.3437	173.5916	169.6618	150.9491	144.3522	159.2515	159.2373	180.0351	191.1541	205.3742 (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	210.6532	185.4793	194.3437	173.5916	169.6618	150.9491	144.3522	159.2515	159.2373	180.0351	191.1541	205.3742 (64)
Total per year (kWh/year) = Sum (64)m =												2124.0831 (64)
Heat gains from water heating, kWh/month	90.3085	79.9769	84.8856	77.3318	76.6789	69.8031	68.2634	73.2174	72.5590	80.1280	83.1713	88.5532 (65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabolic gains (Table 5), Watts												
(66)m	172.6988	172.6988	172.6988	172.6988	172.6988	172.6988	172.6988	172.6988	172.6988	172.6988	172.6988	172.6988 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.0558	61.3348	49.8808	37.7630	28.2283	23.8315	25.7508	33.4718	44.9258	57.0436	66.5783	70.9751 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	433.7836	438.2850	426.9418	402.7935	372.3107	343.6611	324.5214	320.0201	331.3632	355.5115	385.9944	414.6440 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.1482	55.1482	55.1482	55.1482	55.1482	55.1482	55.1482	55.1482	55.1482	55.1482	55.1482	55.1482 (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)	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325 (71)
Water heating gains (Table 5)	121.3824	119.0133	114.0935	107.4053	103.0630	96.9488	91.7519	98.4105	100.7763	107.6989	115.5157	119.0232 (72)
Total internal gains	739.9363	734.3474	706.6306	663.6762	619.3163	580.1558	557.7385	567.6169	592.7798	635.9685	683.8028	720.3567 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
North				1.6600	13.4839		0.7200		0.7000		0.7700		7.8178 (74)
South				8.6900	56.7559		0.7200		0.7000		0.7700		172.2639 (78)
North				4.5100	13.4839		0.7200		0.7000		0.7700		21.2401 (74)
North				2.5300	20.3432		0.6300		0.7000		1.0000		20.4278 (82)
Solar gains	221.7496	320.9359	453.4611	602.6519	682.5255	767.3439	703.7217	635.7129	525.9253	379.6891	264.2758	180.1069	(83)
Total gains	961.6859	1055.2833	1160.0917	1266.3281	1301.8419	1347.4997	1261.4603	1203.3297	1118.7052	1015.6576	948.0786	900.4636	(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	20.9450	20.9450	20.9450	20.9450	20.9450	20.9450	20.9450	20.9450	20.9450	20.9450	20.9450	20.9450
alpha	2.3963	2.3963	2.3963	2.3963	2.3963	2.3963	2.3963	2.3963	2.3963	2.3963	2.3963	2.3963
util living area	0.9291	0.9106	0.8702	0.7977	0.6787	0.5008	0.3720	0.3873	0.6135	0.8034	0.8979	0.9366 (86)
MIT	18.8214	19.0315	19.4821	20.0189	20.5263	20.8467	20.9485	20.9438	20.7296	20.1820	19.4297	18.7706 (87)
Th 2	19.8956	19.8956	19.8956	19.8956	19.8956	19.8956	19.8956	19.8956	19.8956	19.8956	19.8956	19.8956 (88)
util rest of house	0.9187	0.8976	0.8506	0.7654	0.6227	0.4134	0.2578	0.2694	0.5316	0.7637	0.8804	0.9271 (89)
MIT 2	17.0445	17.3443	17.9849	18.7324	19.4071	19.7804	19.8732	19.8709	19.6646	18.9725	17.9212	16.9731 (90)
Living area fraction									fLA = Living area / (4) =			0.0691 (91)
MIT	17.1673	17.4609	18.0884	18.8213	19.4845	19.8541	19.9476	19.9451	19.7382	19.0561	18.0255	17.0974 (92)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Temperature adjustment													-0.1500
adjusted MIT	17.0173	17.3109	17.9384	18.6713	19.3345	19.7041	19.7976	19.7951	19.5882	18.9061	17.8755		16.9474 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8796	0.8553	0.8050	0.7216	0.5899	0.3969	0.2470	0.2579	0.5055	0.7192	0.8361	0.8897	(94)
Useful gains	845.9093	902.6085	933.9242	913.7558	768.0151	534.7887	311.6397	310.3651	565.5427	730.4115	792.6501	801.1493	(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													
	1776.2412	1744.6884	1580.7060	1325.8106	953.2232	581.6367	320.7102	320.3349	655.6479	1055.9187	1448.7697	1750.2566	(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	692.1669	565.8776	481.2056	296.6795	137.7948	0.0000	0.0000	0.0000	0.0000	242.1773	472.4061	706.1358	(98)
Space heating												3594.4436	(98)
Space heating per m2											(98) / (4) =	28.9315	(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		3967.3771	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	692.1669	565.8776	481.2056	296.6795	137.7948	0.0000	0.0000	0.0000	0.0000	242.1773	472.4061	706.1358	(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)	763.9811	624.5890	531.1320	327.4608	152.0914	0.0000	0.0000	0.0000	0.0000	267.3039	521.4195	779.3994	(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	210.6532	185.4793	194.3437	173.5916	169.6618	150.9491	144.3522	159.2515	159.2373	180.0351	191.1541	205.3742	(64)
Efficiency of water heater (217)m	87.8548	87.7007	87.2391	86.3323	84.3655	79.9000	79.9000	79.9000	79.9000	85.7059	87.2347	79.9000	(216)
Fuel for water heating, kWh/month	239.7741	211.4911	222.7715	201.0737	201.1033	188.9225	180.6661	199.3135	199.2958	210.0616	219.1263	233.5221	(219)
Water heating fuel used												2507.1216	(219)
Annual totals kWh/year													
Space heating fuel - main system												3967.3771	(211)
Space heating fuel - secondary												0.0000	(215)

Electricity for pumps and fans:			
(MEV)Decentralised, Database: total watage = 10.3610, total flow = 45.0000, SFP = 0.2302)			
mechanical ventilation fans (SFP = 0.2302)			87.8131 (230a)
central heating pump			30.0000 (230c)
main heating flue fan			45.0000 (230e)
Total electricity for the above, kWh/year			162.8131 (231)
Electricity for lighting (calculated in Appendix L)			487.8190 (232)

Energy saving/generation technologies (Appendices M ,N and Q)			
PV Unit 0 (0.80 * 0.66 * 1201 * 1.00) =		-633.9128	-633.9128 (233)
Total delivered energy for all uses			6491.2179 (238)

10a. Fuel costs - using BEDF prices (519)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3967.3771	9.7400	386.4225	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	2507.1216	9.7400	244.1936	(247)
Mechanical ventilation fans	87.8131	36.8500	32.3591	(249)
Pumps and fans for heating	75.0000	36.8500	27.6375	(249)
Energy for lighting	487.8190	36.8500	179.7613	(250)
Additional standing charges			104.0000	(251)
Energy saving/generation technologies				
PV Unit		-633.9128	-233.5969	(252)
Total energy cost			740.7772	(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	3967.3771	0.2160	856.9534	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2507.1216	0.2160	541.5383	(264)

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

Space and water heating			1398.4917 (265)
Pumps and fans	162.8131	0.5190	84.5000 (267)
Energy for lighting	487.8190	0.5190	253.1780 (268)
Energy saving/generation technologies			
PV Unit	-633.9128	0.5190	-329.0007 (269)
Total kg/year			1407.1690 (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	3967.3771	1.2200	4840.2000 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2507.1216	1.2200	3058.6884 (264)
Space and water heating			7898.8884 (265)
Pumps and fans	162.8131	3.0700	499.8361 (267)
Energy for lighting	487.8190	3.0700	1497.6042 (268)
Energy saving/generation technologies			
PV Unit	-633.9128	3.0700	-1946.1123 (269)
Primary energy kWh/year			7950.2164 (272)
Primary energy kWh/m2/year			63.9908 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:	B 87
Current environmental impact rating:	B 87

(For testing purposes):

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

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.3	-£ 112	-263 kg (18.7%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£112	2.12 kg/m²	B 88 B 89
Total Savings	£112	2.12 kg/m²	

Potential energy efficiency rating:	B 88
Potential environmental impact rating:	B 89

Fuel prices for cost data on this page from database revision number 519 TEST (31 May 2023)
Recommendation texts revision number 4.9c (22 Feb 2014)

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

	Current	Potential	Saving
Electricity	£240	£258	-£18
Mains gas	£735	£604	£130
Space heating	£550	£553	-£2
Water heating	£244	£130	£114
Lighting	£180	£180	£0

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



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

Generated (PV)	-£234	-£234	£0
Total cost of fuels	£741	£628	£112
Total cost of uses	£740	£629	£112
Delivered energy	52 kWh/m ²	42 kWh/m ²	10 kWh/m ²
Carbon dioxide emissions	1.4 tonnes	1.1 tonnes	0.3 tonnes
CO2 emissions per m ²	11 kg/m ²	9 kg/m ²	2 kg/m ²
Primary energy	64 kWh/m ²	52 kWh/m ²	12 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	41.2000 (1b)	x 2.6900 (2b)	= 110.8280 (1b) - (3b)
First floor	60.0800 (1c)	x 2.4300 (2c)	= 145.9944 (1c) - (3c)
Second floor	22.9600 (1d)	x 2.4300 (2d)	= 55.7928 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	124.2400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 312.6152 (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					4.0600
Infiltration rate					0.2030 (18)
Number of sides sheltered					1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1878 (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	0.2394	0.2347	0.2300	0.2066	0.2019	0.1784	0.1784	0.1737	0.1878	0.2019	0.2112	0.2206 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
Solid Door			2.1200	1.3000	2.7560			(26)					
Window (Uw = 1.40)			10.3500	1.3258	13.7216			(27)					
French Door (Uw = 1.40)			4.5100	1.3258	5.9792			(27)					
Roof Window (Uw = 1.80)			2.5300	1.6791	4.2481			(27a)					
150mm EPS B&B			41.2000	0.1700	7.0040	75.0000	3090.0000	(28a)					
Timber Floor to Garage			18.8800	0.1900	3.5872	20.0000	377.6000	(28b)					
140mm Timber Frame	125.6000	15.6700	109.9300	0.1900	20.8867	9.0000	989.3700	(29a)					
Timber Wall to Loft	8.4800		8.4800	0.1900	1.6112	9.0000	76.3200	(29a)					
Timber Wall to Garage	14.8000		14.8000	0.1900	2.8120	9.0000	133.2000	(29a)					
Wall to Void	22.6400		22.6400	0.1400	3.1696	9.0000	203.7600	(29a)					
Dormer Cheek	5.1900	1.3100	3.8800	0.3300	1.2804	9.0000	34.9200	(29a)					
Rooflight Stud Wall	4.1800		4.1800	0.3100	1.2958	9.0000	37.6200	(29a)					
400mm Mineral Wool	29.9100		29.9100	0.1100	3.2901	9.0000	269.1900	(30)					
Sloping	11.1900	0.8400	10.3500	0.2000	2.0700	9.0000	93.1500	(30)					
C2V	18.2400		18.2400	0.1400	2.5536	9.0000	164.1600	(30)					
Dormer Roof	2.7600		2.7600	0.2800	0.7728	9.0000	24.8400	(30)					
Rooflight Sloping	1.8000	1.6900	0.1100	0.3100	0.0341	9.0000	0.9900	(30)					
Total net area of external elements Aum(A, m2)			304.8700					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	77.0724			(33)					
Timebr Frame			62.1000	0.0000	0.0000	20.0000	1242.0000	(32)					
Timber GF			69.8900			9.0000	629.0100	(32c)					
Timber FF			117.5200			9.0000	1057.6800	(32c)					
Timber 2F			30.4100			9.0000	273.6900	(32c)					
Masonry FF			13.3700			39.0000	521.4300	(32c)					
Internal Floor			41.2000			18.0000	741.6000	(32d)					
Internal Floor 2			22.9600			18.0000	413.2800	(32d)					
Internal Ceiling			41.2000			18.0000	741.6000	(32e)					
Internal Ceiling 2			22.9600			18.0000	413.2800	(32e)					
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			11528.6900	(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							92.7937	(35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							24.2421	(36)					
Total fabric heat loss						(33) + (36) =	101.3145	(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	51.5815	51.5815	51.5815	51.5815	51.5815	51.5815	51.5815	51.5815	51.5815	51.5815	51.5815	51.5815	(38)
	152.8960	152.8960	152.8960	152.8960	152.8960	152.8960	152.8960	152.8960	152.8960	152.8960	152.8960	152.8960	(39)
Average = Sum(39)m / 12 =													(39)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2307	1.2307	1.2307	1.2307	1.2307	1.2307	1.2307	1.2307	1.2307	1.2307	1.2307	1.2307 (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												2.8783 (42)
Average daily hot water use (litres/day)												102.5599 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	112.8159	108.7135	104.6111	100.5087	96.4063	92.3039	92.3039	96.4063	100.5087	104.6111	108.7135	112.8159 (44)
Energy content (annual)	167.3028	146.3241	150.9933	131.6396	126.3114	108.9971	101.0018	115.9011	117.2853	136.6847	149.2021	162.0238 (45)
Energy content (annual)												1613.6671 (45)
Distribution loss (46)m = 0.15 x (45)m	25.0954	21.9486	22.6490	19.7459	18.9467	16.3496	15.1503	17.3852	17.5928	20.5027	22.3803	24.3036 (46)
Water storage loss:												190.0000 (47)
Store volume												1.2924 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.6979 (55)
Enter (49) or (54) in (55)												
Total storage loss	21.6341	19.5405	21.6341	20.9363	21.6341	20.9363	21.6341	21.6341	20.9363	21.6341	20.9363	21.6341 (56)
If cylinder contains dedicated solar storage	13.0944	11.8272	13.0944	12.6720	13.0944	12.6720	13.0944	13.0944	12.6720	13.0944	12.6720	13.0944 (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	203.6595	179.1624	185.9543	160.0700	149.8738	131.5743	124.3317	140.1614	147.0664	171.6457	184.3860	198.3805 (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												1.1239 (H8)
Utilisation factor												0.5892 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												109.5000 (H13)
Daily hot water demand												102.5599 (H14)
Volume ratio Veff/V												1.0677 (H15)
Solar storage volume factor												1.0000 (H16)
Solar input												-939.6619 (H17)
Solar input	-27.2483	-45.4696	-77.4400	-103.7848	-128.2174	-126.0581	-124.3922	-108.6821	-85.1199	-58.1269	-32.3204	-22.8022 (63)
Solar input (sum of months) = Sum (63)m =												-939.6619 (63)
Output from w/h	176.4112	133.6928	108.5144	56.2852	21.6564	5.5162	0.0000	31.4793	61.9465	113.5189	152.0656	175.5784 (64)
Total per year (kWh/year) = Sum (64)m =												1036.6649 (64)
Heat gains from water heating, kWh/month	84.7136	74.9234	78.1741	66.5145	60.8485	54.3033	52.2470	57.9454	62.8222	73.4165	77.7569	82.9583 (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	172.6988	172.6988	172.6988	172.6988	172.6988	172.6988	172.6988	172.6988	172.6988	172.6988	172.6988	172.6988 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.0558	61.3348	49.8808	37.7630	28.2283	23.8315	25.7508	33.4718	44.9258	57.0436	66.5783	70.9751 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	433.7836	438.2850	426.9418	402.7935	372.3107	343.6611	324.5214	320.0201	331.3632	355.5115	385.9944	414.6440 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.1482	55.1482	55.1482	55.1482	55.1482	55.1482	55.1482	55.1482	55.1482	55.1482	55.1482	55.1482 (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)	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325 (71)
Water heating gains (Table 5)	113.8623	111.4932	105.0727	92.3812	81.7856	75.4213	70.2244	77.8835	87.2531	98.6781	107.9956	111.5031 (72)
Total internal gains	732.4162	726.8274	697.6097	648.6521	598.0390	558.6283	536.2110	547.0899	579.2566	626.9476	676.2828	712.8366 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
North					1.6600	10.6334	0.7200	0.7000			0.7700			6.1652 (74)
South					8.6900	46.7521	0.7200	0.7000			0.7700			141.9006 (78)
North					4.5100	10.6334	0.7200	0.7000			0.7700			16.7499 (74)
North					2.5300	16.1759	0.6300	0.7000			1.0000			16.2431 (82)

Solar gains	181.0588	306.9507	426.3806	555.8118	659.8088	674.6676	642.0433	559.3101	469.2626	339.9784	216.3519	155.4165	(83)	
Total gains	913.4751	1033.7781	1123.9903	1204.4639	1257.8477	1233.2959	1178.2543	1106.4000	1048.5192	966.9260	892.6347	868.2531	(84)	

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Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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	20.9450	20.9450	20.9450	20.9450	20.9450	20.9450	20.9450	20.9450	20.9450	20.9450	20.9450	20.9450
alpha	2.3963	2.3963	2.3963	2.3963	2.3963	2.3963	2.3963	2.3963	2.3963	2.3963	2.3963	2.3963
util living area	0.9436	0.9234	0.8925	0.8374	0.7475	0.6205	0.4958	0.5361	0.7077	0.8541	0.9234	0.9495 (86)
MIT	18.5297	18.7990	19.2272	19.7710	20.2964	20.6885	20.8707	20.8391	20.5430	19.8838	19.0999	18.4526 (87)
Th 2	19.8956	19.8956	19.8956	19.8956	19.8956	19.8956	19.8956	19.8956	19.8956	19.8956	19.8956	19.8956 (88)
util rest of house	0.9356	0.9128	0.8768	0.8118	0.7042	0.5483	0.3938	0.4354	0.6442	0.8259	0.9109	0.9423 (89)
MIT 2	16.6231	17.0095	17.6226	18.3910	19.1099	19.6102	19.8102	19.7827	19.4450	18.5637	17.4498	16.5123 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	16.7549	17.1332	17.7335	18.4865	19.1920	19.6847	19.8835	19.8557	19.5209	18.6549	17.5639	16.6465 (92)
Temperature adjustment	-0.1500											
adjusted MIT	16.6049	16.9832	17.5835	18.3365	19.0420	19.5347	19.7335	19.7057	19.3709	18.5049	17.4139	16.4965 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9004	0.8727	0.8326	0.7662	0.6645	0.5216	0.3773	0.4160	0.6084	0.7795	0.8703	0.9089 (94)
Useful gains	822.4482	902.2062	935.8341	922.8590	835.7967	643.3211	444.5762	460.2738	637.9360	753.7020	776.8174	789.1442 (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	1881.3712	1847.4798	1694.6229	1442.7955	1122.5576	754.5028	479.1058	505.4289	805.8999	1208.6342	1576.9595	1880.0829 (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	787.8387	635.2239	564.5388	374.3543	213.3501	0.0000	0.0000	0.0000	0.0000	338.4696	576.1023	811.6584 (98)
Space heating												4301.5361 (98)
Space heating per m2												(98) / (4) = 34.6228 (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												4747.8323 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	787.8387	635.2239	564.5388	374.3543	213.3501	0.0000	0.0000	0.0000	0.0000	338.4696	576.1023	811.6584 (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)	869.5791	701.1301	623.1113	413.1946	235.4858	0.0000	0.0000	0.0000	0.0000	373.5867	635.8745	895.8702 (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	176.4112	133.6928	108.5144	56.2852	21.6564	5.5162	0.0000	31.4793	61.9465	113.5189	152.0656	175.5784 (64)
Efficiency of water heater	88.4333	88.5384	88.6852	89.0415	89.4956	79.9000	79.9000	79.9000	79.9000	87.6519	88.1352	79.9000 (216)
(217)m	88.4333	88.5384	88.6852	89.0415	89.4956	79.9000	79.9000	79.9000	79.9000	87.6519	88.1352	88.4924 (217)
Fuel for water heating, kWh/month	199.4849	150.9997	122.3591	63.2123	24.1983	6.9039	0.0000	39.3984	77.5301	129.5110	172.5368	198.4107 (219)
Water heating fuel used												1184.5452 (219)
Annual totals kWh/year												
Space heating fuel - main system												4747.8323 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
(MEVDecentralised, Database: total watage = 10.3610, total flow = 45.0000, SFP = 0.2302)												
mechanical ventilation fans (SFP = 0.2302)												87.8131 (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												212.8131 (231)
Electricity for lighting (calculated in Appendix L)												487.8190 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV Unit 0 (0.80 * 0.66 * 1080 * 1.00) =										-569.9890		-569.9890 (233)
Total delivered energy for all uses												6063.0205 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	4747.8323	3.4800	165.2246 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1184.5452	3.4800	41.2222 (247)

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CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Mechanical ventilation fans	87.8131	13.1900	11.5825 (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	487.8190	13.1900	64.3433 (250)
Additional standing charges			120.0000 (251)

Energy saving/generation technologies			
PV Unit	-569.9890	13.1900	-75.1815 (252)
Total energy cost			343.6786 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):			0.4200 (256)
Energy cost factor (ECF)		$[(255) \times (256)] / [(4) + 45.0] =$	0.8529 (257)
SAP value			88.1020
SAP rating (Section 12)			88 (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	4747.8323	0.2160	1025.5318 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1184.5452	0.2160	255.8618 (264)
Space and water heating			1281.3935 (265)
Pumps and fans	212.8131	0.5190	110.4500 (267)
Energy for lighting	487.8190	0.5190	253.1780 (268)
Energy saving/generation technologies			
PV Unit	-569.9890	0.5190	-295.8243 (269)
Total kg/year			1349.1973 (272)
CO2 emissions per m2			10.8600 (273)
EI value			89.3174
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	41.2000 (1b)	x 2.6900 (2b)	= 110.8280 (1b) - (3b)
First floor	60.0800 (1c)	x 2.4300 (2c)	= 145.9944 (1c) - (3c)
Second floor	22.9600 (1d)	x 2.4300 (2d)	= 55.7928 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	124.2400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 312.6152 (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					4.0600
Infiltration rate					0.2030 (18)
Number of sides sheltered					1 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.1878 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.4000	4.1000	4.1000	3.9000	3.9000	3.7000	3.7000	3.5000	3.5000	3.8000	3.7000	3.9000 (22)
Wind factor	1.1000	1.0250	1.0250	0.9750	0.9750	0.9250	0.9250	0.8750	0.8750	0.9500	0.9250	0.9750 (22a)
Adj infilt rate	0.2066	0.1925	0.1925	0.1831	0.1831	0.1737	0.1737	0.1643	0.1643	0.1784	0.1737	0.1831 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
Solid Door			2.1200	1.3000	2.7560			(26)					
Window (Uw = 1.40)			10.3500	1.3258	13.7216			(27)					
French Door (Uw = 1.40)			4.5100	1.3258	5.9792			(27)					
Roof Window (Uw = 1.80)			2.5300	1.6791	4.2481			(27a)					
150mm EPS B&B			41.2000	0.1700	7.0040	75.0000	3090.0000	(28a)					
Timber Floor to Garage			18.8800	0.1900	3.5872	20.0000	377.6000	(28b)					
140mm Timber Frame	125.6000	15.6700	109.9300	0.1900	20.8867	9.0000	989.3700	(29a)					
Timber Wall to Loft	8.4800		8.4800	0.1900	1.6112	9.0000	76.3200	(29a)					
Timber Wall to Garage	14.8000		14.8000	0.1900	2.8120	9.0000	133.2000	(29a)					
Wall to Void	22.6400		22.6400	0.1400	3.1696	9.0000	203.7600	(29a)					
Dormer Cheek	5.1900	1.3100	3.8800	0.3300	1.2804	9.0000	34.9200	(29a)					
Rooflight Stud Wall	4.1800		4.1800	0.3100	1.2958	9.0000	37.6200	(29a)					
400mm Mineral Wool	29.9100		29.9100	0.1100	3.2901	9.0000	269.1900	(30)					
Sloping	11.1900	0.8400	10.3500	0.2000	2.0700	9.0000	93.1500	(30)					
C2V	18.2400		18.2400	0.1400	2.5536	9.0000	164.1600	(30)					
Dormer Roof	2.7600		2.7600	0.2800	0.7728	9.0000	24.8400	(30)					
Rooflight Sloping	1.8000	1.6900	0.1100	0.3100	0.0341	9.0000	0.9900	(30)					
Total net area of external elements Aum(A, m2)			304.8700					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	77.0724			(33)					
Timebr Frame			62.1000	0.0000	0.0000	20.0000	1242.0000	(32)					
Timber GF			69.8900			9.0000	629.0100	(32c)					
Timber FF			117.5200			9.0000	1057.6800	(32c)					
Timber 2F			30.4100			9.0000	273.6900	(32c)					
Masonry FF			13.3700			39.0000	521.4300	(32c)					
Internal Floor			41.2000			18.0000	741.6000	(32d)					
Internal Floor 2			22.9600			18.0000	413.2800	(32d)					
Internal Ceiling			41.2000			18.0000	741.6000	(32e)					
Internal Ceiling 2			22.9600			18.0000	413.2800	(32e)					
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =				11528.6900 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								92.7937 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								24.2421 (36)					
Total fabric heat loss				(33) + (36) =				101.3145 (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	51.5815	51.5815	51.5815	51.5815	51.5815	51.5815	51.5815	51.5815	51.5815	51.5815	51.5815	51.5815	(38)
	152.8960	152.8960	152.8960	152.8960	152.8960	152.8960	152.8960	152.8960	152.8960	152.8960	152.8960	152.8960	(39)
Average = Sum(39)m / 12 =													152.8960 (39)

FULL SAP CALCULATION PRINTOUT

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HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2307	1.2307	1.2307	1.2307	1.2307	1.2307	1.2307	1.2307	1.2307	1.2307	1.2307	1.2307 (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												2.8783 (42)
Average daily hot water use (litres/day)												102.5599 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	112.8159	108.7135	104.6111	100.5087	96.4063	92.3039	92.3039	96.4063	100.5087	104.6111	108.7135	112.8159 (44)
Energy content (annual)	167.3028	146.3241	150.9933	131.6396	126.3114	108.9971	101.0018	115.9011	117.2853	136.6847	149.2021	162.0238 (45)
Distribution loss (46)m = 0.15 x (45)m	25.0954	21.9486	22.6490	19.7459	18.9467	16.3496	15.1503	17.3852	17.5928	20.5027	22.3803	24.3036 (46)
Water storage loss:												190.0000 (47)
Store volume												1.2924 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.6979 (55)
Enter (49) or (54) in (55)												
Total storage loss	21.6341	19.5405	21.6341	20.9363	21.6341	20.9363	21.6341	21.6341	20.9363	21.6341	20.9363	21.6341 (56)
If cylinder contains dedicated solar storage	13.0944	11.8272	13.0944	12.6720	13.0944	12.6720	13.0944	13.0944	12.6720	13.0944	12.6720	13.0944 (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	203.6595	179.1624	185.9543	160.0700	149.8738	131.5743	124.3317	140.1614	147.0664	171.6457	184.3860	198.3805 (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												1.2499 (H8)
Utilisation factor												0.5507 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												109.5000 (H13)
Daily hot water demand												102.5599 (H14)
Volume ratio Veff/V												1.0677 (H15)
Solar storage volume factor												1.0000 (H16)
Solar input												-976.6600 (H17)
Solar input	-32.0616	-45.5896	-78.3575	-105.7224	-123.5626	-133.2227	-126.8176	-115.5860	-90.3190	-62.1132	-37.9204	-25.3875 (63)
Solar input (sum of months) = Sum (63)m =												-976.6600 (63)
Output from w/h	171.5979	133.5729	107.5968	54.3476	26.3112	0.0000	0.0000	24.5754	56.7474	109.5326	146.4656	172.9930 (64)
Total per year (kWh/year) = Sum (64)m =												1003.7405 (64)
Heat gains from water heating, kWh/month	84.7136	74.9234	78.1741	66.5145	60.8485	54.3033	52.2470	57.9454	62.8222	73.4165	77.7569	82.9583 (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	172.6988	172.6988	172.6988	172.6988	172.6988	172.6988	172.6988	172.6988	172.6988	172.6988	172.6988	172.6988 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.0558	61.3348	49.8808	37.7630	28.2283	23.8315	25.7508	33.4718	44.9258	57.0436	66.5783	70.9751 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	433.7836	438.2850	426.9418	402.7935	372.3107	343.6611	324.5214	320.0201	331.3632	355.5115	385.9944	414.6440 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.1482	55.1482	55.1482	55.1482	55.1482	55.1482	55.1482	55.1482	55.1482	55.1482	55.1482	55.1482 (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)	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325	-115.1325 (71)
Water heating gains (Table 5)	113.8623	111.4932	105.0727	92.3812	81.7856	75.4213	70.2244	77.8835	87.2531	98.6781	107.9956	111.5031 (72)
Total internal gains	732.4162	726.8274	697.6097	648.6521	598.0390	558.6283	536.2110	547.0899	579.2566	626.9476	676.2828	712.8366 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W
North					1.6600	13.4839	0.7200	0.7000			0.7700	7.8178 (74)
South					8.6900	56.7559	0.7200	0.7000			0.7700	172.2639 (78)
North					4.5100	13.4839	0.7200	0.7000			0.7700	21.2401 (74)
North					2.5300	20.3432	0.6300	0.7000			1.0000	20.4278 (82)

Solar gains	221.7496	320.9359	453.4611	602.6519	682.5255	767.3439	703.7217	635.7129	525.9253	379.6891	264.2758	180.1069 (83)
Total gains	954.1658	1047.7633	1151.0709	1251.3040	1280.5645	1325.9722	1239.9327	1182.8028	1105.1819	1006.6367	940.5586	892.9435 (84)

FULL SAP CALCULATION PRINTOUT

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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	20.9450	20.9450	20.9450	20.9450	20.9450	20.9450	20.9450	20.9450	20.9450	20.9450	20.9450	20.9450
alpha	2.3963	2.3963	2.3963	2.3963	2.3963	2.3963	2.3963	2.3963	2.3963	2.3963	2.3963	2.3963
util living area	0.9301	0.9117	0.8719	0.8011	0.6847	0.5068	0.3776	0.3930	0.6181	0.8060	0.8994	0.9376 (86)
MIT	18.8126	19.0233	19.4734	20.0077	20.5164	20.8426	20.9468	20.9419	20.7249	20.1752	19.4218	18.7616 (87)
Th 2	19.8956	19.8956	19.8956	19.8956	19.8956	19.8956	19.8956	19.8956	19.8956	19.8956	19.8956	19.8956 (88)
util rest of house	0.9198	0.8989	0.8524	0.7692	0.6289	0.4189	0.2620	0.2737	0.5362	0.7666	0.8820	0.9282 (89)
MIT 2	17.0321	17.3327	17.9731	18.7179	19.3958	19.7770	19.8724	19.8701	19.6601	18.9639	17.9103	16.9604 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	17.1552	17.4496	18.0768	18.8071	19.4733	19.8507	19.9467	19.9442	19.7337	19.0476	18.0148	17.0849 (92)
Temperature adjustment	-0.1500											
adjusted MIT	17.0052	17.2996	17.9268	18.6571	19.3233	19.7007	19.7967	19.7942	19.5837	18.8976	17.8648	16.9349 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8810	0.8568	0.8069	0.7251	0.5955	0.4020	0.2510	0.2620	0.5097	0.7218	0.8378	0.8911 (94)
Useful gains	840.6165	897.6813	928.8517	907.3417	762.6292	532.9756	311.1871	309.8731	563.2960	726.5973	787.9975	795.6982 (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	1774.3849	1742.9559	1578.9308	1323.6293	951.5110	581.1084	320.5771	320.1898	654.9588	1054.6176	1447.1322	1748.3488 (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	694.7237	568.0246	483.6589	299.7270	140.5280	0.0000	0.0000	0.0000	0.0000	244.0471	474.5770	708.7721 (98)
Space heating												3614.0583 (98)
Space heating per m2	(98) / (4) =											29.0893 (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												3989.0269 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	694.7237	568.0246	483.6589	299.7270	140.5280	0.0000	0.0000	0.0000	0.0000	244.0471	474.5770	708.7721 (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)	766.8032	626.9587	533.8398	330.8245	155.1082	0.0000	0.0000	0.0000	0.0000	269.3676	523.8156	782.3091 (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	171.5979	133.5729	107.5968	54.3476	26.3112	0.0000	0.0000	24.5754	56.7474	109.5326	146.4656	172.9930 (64)
Efficiency of water heater	88.2589	88.3475	88.4446	88.7752	88.7262	79.9000	79.9000	79.9000	79.9000	86.9912	87.8262	79.9000 (216)
Fuel for water heating, kWh/month	194.4257	151.1903	121.6545	61.2193	29.6544	0.0000	0.0000	30.7578	71.0230	125.9123	166.7676	88.2806 (217)
Water heating fuel used												195.9582 (219)
Annual totals kWh/year												1148.5631 (219)
Space heating fuel - main system												3989.0269 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
(MEV)Decentralised, Database: total watage = 10.3610, total flow = 45.0000, SFP = 0.2302)												
mechanical ventilation fans (SFP = 0.2302)												87.8131 (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												212.8131 (231)
Electricity for lighting (calculated in Appendix L)												487.8190 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV Unit 0 (0.80 * 0.66 * 1201 * 1.00) =										-633.9128	-633.9128 (233)	
Total delivered energy for all uses										5204.3092	5204.3092 (238)	

10a. Fuel costs - using BEDF prices (519)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3989.0269	9.7400	388.5312 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1148.5631	9.7400	111.8700 (247)

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Mechanical ventilation fans	87.8131	36.8500	32.3591 (249)
Pumps and fans for heating	75.0000	36.8500	27.6375 (249)
Pump for solar water heating	50.0000	36.8500	18.4250 (249)
Energy for lighting	487.8190	36.8500	179.7613 (250)
Additional standing charges			104.0000 (251)
Energy saving/generation technologies			
PV Unit	-633.9128	36.8500	-233.5969 (252)
Total energy cost			628.9873 (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	3989.0269	0.2160	861.6298 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1148.5631	0.2160	248.0896 (264)
Space and water heating			1109.7194 (265)
Pumps and fans	212.8131	0.5190	110.4500 (267)
Energy for lighting	487.8190	0.5190	253.1780 (268)
Energy saving/generation technologies			
PV Unit	-633.9128	0.5190	-329.0007 (269)
Total kg/year			1144.3467 (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	3989.0269	1.2200	4866.6128 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1148.5631	1.2200	1401.2470 (264)
Space and water heating			6267.8598 (265)
Pumps and fans	212.8131	3.0700	653.3361 (267)
Energy for lighting	487.8190	3.0700	1497.6042 (268)
Energy saving/generation technologies			
PV Unit	-633.9128	3.0700	-1946.1123 (269)
Primary energy kWh/year			6472.6877 (272)
Primary energy kWh/m2/year			52.0983 (273)

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

Overheating Calculation Input Data

Dwelling type	SemiDetached House
Number of storeys	3
Cross ventilation possible	Yes
SAP Region	Southern England
Front of dwelling faces	South
Overshading	Average or unknown
Thermal mass parameter	92.8 (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	412.65 (P1)
Transmission heat loss coefficient	101.31 (37)
Summer heat loss coefficient	513.97 (P2)

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

Solar shading	Z_blinds	Solar access	Z_overhangs	Z_summer
Orientation				
North	1.000	0.90	1.000	0.900 (P8)
North	1.000	1.00	1.000	1.000 (P8)
South	1.000	0.90	1.000	0.900 (P8)

[Jul]	Area m2	Solar flux Table 6a W/m2	Specific data g or Table 6b	FF Specific data or Table 6c	Shading	Gains W
North	1.6600	87.1704	0.7200	0.7000	0.9000	59.0735
South	8.6900	118.5567	0.7200	0.7000	0.9000	420.5923
North	4.5100	87.1704	0.7200	0.7000	0.9000	160.4949
North	2.5300	181.9946	0.6300	0.7000	1.0000	182.7512
total:						822.9120

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	Jun	Jul	Aug	
Solar gains	886	823	731	(P3)
Internal gains	577	555	565	
Total summer gains	1463	1378	1296	(P5)
Summer gain/loss ratio	2.85	2.68	2.52	(P6)
Summer external temperature	15.40	17.30	17.30	
Thermal mass temperature increment (TMP = 92.8)	1.35	1.35	1.35	
Threshold temperature	19.60	21.33	21.17	(P7)
Likelihood of high internal temperature	Not significant	Slight	Slight	
Assessment of likelihood of high internal temperature:	Slight			