

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Unit 2 Eldon Terrace			Issued on Date	03/06/2021
Assessment Reference	001	Prop Type Ref			
Property					
SAP Rating	86 B	DER	13.56	TER	16.75
Environmental	89 B	% DER<TER	19.06		
CO ₂ Emissions (t/year)	1.09	DFEE	33.65	TFEE	46.74
General Requirements Compliance	Pass	% DFEE<TFEE	28.01		
Assessor Details	Mr. Andrew Sadler, Build Pass Ltd, Tel: 01962 657180, andrew@buildpass.co.uk			Assessor ID	P628-0001
Client					

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

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DWELLING AS DESIGNED

Semi-Detached House, total floor area 99 m²

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

1a TER and DER

Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 16.75 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 13.56 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 46.7 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 33.7 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	0.13 (max. 0.20)	0.17 (max. 0.35)	OK
Openings	1.15 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 4.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from database
Worcester Greenstar 25Si Compact ErP
Combi boiler
Efficiency: 89.8% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls: No cylinder

Boiler interlock Yes OK

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system (decentralised)
Specific fan power: 0.1600 0.1600
Maximum 0.7 OK

9 Summertime temperature

Overheating risk (Thames Valley): Not significant OK
Based on:
Overshading: Average
Windows facing North: 3.60 m², No overhang
Windows facing South: 5.78 m², No overhang
Air change rate: 8.00 ach
Blinds/curtains: None

10 Key features

External wall U-value 0.13 W/m²K
Party wall U-value 0.00 W/m²K
Floor U-value 0.12 W/m²K
Exposed floor U-value 0.12 W/m²K
Door U-value 0.85 W/m²K
Thermal bridging y-value 0.035 W/m²K

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (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	6.5600 (1b)	x 2.3000 (2b)	= 15.0880 (1b) - (3b)
First floor	48.2600 (1c)	x 2.3000 (2c)	= 110.9980 (1c) - (3c)
Second floor	44.2600 (1d)	x 2.1700 (2d)	= 96.0442 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	99.0800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 222.1302 (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												4.0000
Infiltration rate												0.2000 (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) =	0.1850 (21)	
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
	0.2359	0.2313	0.2266	0.2035	0.1989	0.1758	0.1758	0.1711	0.1850	0.1989	0.2081	0.2174 (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
Door			2.1000	0.8500	1.7850		(26)
Windows (Uw = 1.20)			9.3800	1.1450	10.7405		(27)
Roof Lights (Uw = 1.40)			0.6400	1.3258	0.8485		(27a)
Heat Loss Floor 1			28.9000	0.1200	3.4680		(28a)
Exposed Floor			44.5000	0.1200	5.3400		(28b)
External Wall 1	44.8500	8.4800	36.3700	0.1800	6.5466		(29a)
Dormer Cheeks	6.6000	3.0000	3.6000	0.1300	0.4680		(29a)
Sheltered Wall	37.9500		37.9500	0.1842	6.9890		(29a)
External Roof 1	30.8800	0.6400	30.2400	0.1300	3.9312		(30)
Dormer Roof	1.9500		1.9500	0.1700	0.3315		(30)
Flat Roof	22.3300		22.3300	0.1300	2.9029		(30)
Roof above bathroom	4.4000		4.4000	0.1300	0.5720		(30)
Total net area of external elements Aum(A, m ²)			222.3600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		43.9231		(33)
Party Wall 1			45.1000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.7540 (36)
Total fabric heat loss						(33) + (36) =	51.6771 (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	36.6515	36.6515	36.6515	36.6515	36.6515	36.6515	36.6515	36.6515	36.6515	36.6515	36.6515	36.6515 (38)
Average = Sum(39)m / 12 =	88.3286	88.3286	88.3286	88.3286	88.3286	88.3286	88.3286	88.3286	88.3286	88.3286	88.3286	88.3286 (39)
HLP	0.8915	0.8915	0.8915	0.8915	0.8915	0.8915	0.8915	0.8915	0.8915	0.8915	0.8915	0.8915 (40)
HLP (average)												0.8915 (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	2.7308 (42)
Average daily hot water use (litres/day)	99.0576 (43)

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	108.9633	105.0010	101.0387	97.0764	93.1141	89.1518	89.1518	93.1141	97.0764	101.0387	105.0010	108.9633	(44)
Energy conte	161.5894	141.3272	145.8370	127.1442	121.9979	105.2749	97.5527	111.9431	113.2801	132.0170	144.1069	156.4907	(45)
Energy content (annual)										Total =	Sum (45)m =	1558.5611	(45)
Distribution loss (46)m = 0.15 x (45)m	24.2384	21.1991	21.8755	19.0716	18.2997	15.7912	14.6329	16.7915	16.9920	19.8026	21.6160	23.4736	(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	0.0000	(57)
Combi loss	29.4928	26.6386	29.4928	28.5414	29.4928	28.5414	29.4928	29.4928	28.5414	29.4928	28.5414	29.4928	(61)
Total heat required for water heating calculated for each month	191.0822	167.9658	175.3297	155.6856	151.4907	133.8163	127.0455	141.4359	141.8215	161.5098	172.6483	185.9835	(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)
FGHRS	-23.7824	-20.5689	-20.5595	-17.1172	-14.7814	-12.1937	-11.4545	-12.9223	-13.0102	-17.6909	-20.7603	-23.4494	eq. (G5)
Output from w/h	167.2998	147.3969	154.7702	138.5684	136.7093	121.6227	115.5909	128.5136	128.8113	143.8189	151.8880	162.5341	(64)
Heat gains from water heating, kWh/month	61.1017	53.6509	55.8640	49.4108	47.9375	42.1393	39.8095	44.5943	44.8010	51.2688	55.0509	59.4064	(65)
										Total per year (kWh/year) =	Sum (64)m =	1697.5240	(64)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.5422	136.5422	136.5422	136.5422	136.5422	136.5422	136.5422	136.5422	136.5422	136.5422	136.5422	136.5422	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	26.0995	23.1813	18.8523	14.2724	10.6688	9.0071	9.7324	12.6506	16.9796	21.5595	25.1631	26.8249	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	254.8318	257.4762	250.8125	236.6263	218.7187	201.8881	190.6443	187.9999	194.6636	208.8498	226.7574	243.5880	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.6542	36.6542	36.6542	36.6542	36.6542	36.6542	36.6542	36.6542	36.6542	36.6542	36.6542	36.6542	(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)	-109.2338	-109.2338	-109.2338	-109.2338	-109.2338	-109.2338	-109.2338	-109.2338	-109.2338	-109.2338	-109.2338	-109.2338	(71)
Water heating gains (Table 5)	82.1259	79.8377	75.0860	68.6261	64.4321	58.5267	53.5073	59.9386	62.2236	68.9097	76.4596	79.8473	(72)
Total internal gains	430.0199	427.4579	411.7135	386.4875	360.7823	336.3846	320.8467	327.5517	340.8295	366.2818	395.3428	417.2228	(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				3.6000	10.6334	0.6300	0.0000	0.7700	18.5697 (74)			
South				5.7800	46.7521	0.6300	0.0000	0.7700	131.0871 (78)			
North				0.6400	16.1759	0.6300	0.7000	1.0000	4.1089 (82)			
Solar gains	153.7658	257.9563	347.9249	431.6725	490.5456	491.8318	472.0388	426.2278	376.0252	283.2107	183.3206	132.2171 (83)
Total gains	583.7857	685.4142	759.6384	818.1599	851.3280	828.2165	792.8855	753.7796	716.8547	649.4925	578.6634	549.4399 (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	77.8973	77.8973	77.8973	77.8973	77.8973	77.8973	77.8973	77.8973	77.8973	77.8973	77.8973	77.8973
alpha	6.1932	6.1932	6.1932	6.1932	6.1932	6.1932	6.1932	6.1932	6.1932	6.1932	6.1932	6.1932
util living area	0.9981	0.9943	0.9836	0.9475	0.8451	0.6608	0.4871	0.5336	0.7825	0.9627	0.9950	0.9987 (86)
MIT	20.2903	20.4036	20.5580	20.7371	20.8800	20.9426	20.9543	20.9530	20.9199	20.7372	20.4696	20.2584 (87)
Th 2	20.1747	20.1747	20.1747	20.1747	20.1747	20.1747	20.1747	20.1747	20.1747	20.1747	20.1747	20.1747 (88)
util rest of house	0.9974	0.9925	0.9782	0.9302	0.8000	0.5847	0.3974	0.4407	0.7128	0.9468	0.9930	0.9987 (89)
MIT 2	19.2145	19.3795	19.6026	19.8538	20.0367	20.1015	20.1097	20.1091	20.0824	19.8582	19.4764	19.1679 (90)
Living area fraction									fLA = Living area / (4) =			0.2947 (91)
MIT	19.5315	19.6813	19.8841	20.1141	20.2852	20.3494	20.3586	20.3578	20.3292	20.1173	19.7691	19.4893 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.3815	19.5313	19.7341	19.9641	20.1352	20.1994	20.2086	20.2078	20.1792	19.9673	19.6191	19.3393 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9966	0.9907	0.9746	0.9249	0.7976	0.5870	0.4012	0.4445	0.7132	0.9418	0.9913	0.9976	(94)
Useful gains	581.7996	679.0096	740.3373	756.7384	679.0317	486.2000	318.0676	335.0760	511.2377	611.6841	573.6169	548.1261	(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	1332.1312	1292.3624	1168.9522	977.2772	745.0691	494.5845	318.7432	336.3376	536.9677	827.3979	1105.7950	1337.2298	(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	558.2467	412.1731	318.8895	158.7880	49.1318	0.0000	0.0000	0.0000	0.0000	160.4911	383.1683	587.0931	(98)

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Space heating
Space heating per m2 (98) / (4) = 2627.9815 (98)
26.5238 (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 %) 90.7000 (206)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)
Space heating requirement 2897.4438 (211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	558.2467	412.1731	318.8895	158.7880	49.1318	0.0000	0.0000	0.0000	0.0000	160.4911	383.1683	587.0931 (98)
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000 (210)
Space heating fuel (main heating system)	615.4870	454.4356	351.5871	175.0694	54.1696	0.0000	0.0000	0.0000	0.0000	176.9471	422.4567	647.2912 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating requirement	167.2998	147.3969	154.7702	138.5684	136.7093	121.6227	115.5909	128.5136	128.8113	143.8189	151.8880	162.5341 (64)
Efficiency of water heater (217)m	89.8192	89.6952	89.4569	88.9374	87.9485	87.0000	87.0000	87.0000	87.0000	88.9129	89.6181	87.0000 (216)
Fuel for water heating, kWh/month	186.2629	164.3309	173.0110	155.8045	155.4424	139.7962	132.8632	147.7167	148.0590	161.7525	169.4836	180.8521 (219)
Water heating fuel used												1915.3749 (219)
Annual totals kWh/year												
Space heating fuel - main system												2897.4438 (211)
Space heating fuel - secondary												0.0000 (215)

Electricity for pumps and fans:
(MEV)Decentralised, Database: total watage = 8.2800, total flow = 45.0000, SFP = 0.1840)
mechanical ventilation fans (SFP = 0.1840) 49.8638 (230a)
central heating pump 30.0000 (230c)
main heating flue fan 45.0000 (230e)
Total electricity for the above, kWh/year 124.8638 (231)
Electricity for lighting (calculated in Appendix L) 460.9252 (232)
Total delivered energy for all uses 5398.6077 (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	2897.4438	0.2160	625.8479 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1915.3749	0.2160	413.7210 (264)
Space and water heating			1039.5688 (265)
Pumps and fans	124.8638	0.5190	64.8043 (267)
Energy for lighting	460.9252	0.5190	239.2202 (268)
Total CO2, kg/year			1343.5933 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			13.5600 (273)

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

	TFA	N	EF	
DER				13.5600 ZC1
Total Floor Area	99.0800			
Assumed number of occupants		2.7308		
CO2 emission factor in Table 12 for electricity displaced from grid		0.5190		
CO2 emissions from appliances, equation (L14)				15.2410 ZC2
CO2 emissions from cooking, equation (L16)				1.8625 ZC3
Total CO2 emissions				30.6636 ZC4
Residual CO2 emissions offset from biofuel CHP				0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year				0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation				0.0000 ZC7
Net CO2 emissions				30.6636 ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (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	6.5600 (1b)	x 2.3000 (2b)	= 15.0880 (1b) - (3b)
First floor	48.2600 (1c)	x 2.3000 (2c)	= 110.9980 (1c) - (3c)
Second floor	44.2600 (1d)	x 2.1700 (2d)	= 96.0442 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	99.0800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 222.1302 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour 30.0000 / (5) = 0.1351 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3851 (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) =		0.3562 (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	0.4541	0.4452	0.4363	0.3918	0.3829	0.3384	0.3384	0.3295	0.3562	0.3829	0.4007	0.4185 (22b)
Effective ac	0.6031	0.5991	0.5952	0.5768	0.5733	0.5572	0.5572	0.5543	0.5634	0.5733	0.5803	0.5876 (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			2.1000	1.0000	2.1000		(26)
TER Opening Type (Uw = 1.40)			9.3800	1.3258	12.4356		(27)
TER Room Window (Uw = 1.70)			0.6400	1.5918	1.0187		(27a)
Heat Loss Floor 1			28.9000	0.1300	3.7570		(28a)
Exposed Floor			44.5000	0.1300	5.7850		(28b)
External Wall 1	44.8500	8.4800	36.3700	0.1800	6.5466		(29a)
Dormer Cheeks	6.6000	3.0000	3.6000	0.1800	0.6480		(29a)
Sheltered Wall	37.9500		37.9500	0.1800	6.8310		(29a)
External Roof 1	30.8800	0.6400	30.2400	0.1300	3.9312		(30)
Dormer Roof	1.9500		1.9500	0.1300	0.2535		(30)
Flat Roof	22.3300		22.3300	0.1300	2.9029		(30)
Roof above bathroom	4.4000		4.4000	0.1300	0.5720		(30)
Total net area of external elements Aum(A, m ²)			222.3600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.7815		(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)							8.7730 (36)
Total fabric heat loss						(33) + (36) =	55.5545 (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	44.2101	43.9166	43.6289	42.2776	42.0248	40.8478	40.8478	40.6299	41.3012	42.0248	42.5362	43.0709 (38)
Heat transfer coeff	99.7646	99.4711	99.1834	97.8321	97.5793	96.4023	96.4023	96.1844	96.8557	97.5793	98.0908	98.6255 (39)
Average = Sum(39)m / 12 =												97.8309 (39)
HLP	1.0069	1.0039	1.0010	0.9874	0.9849	0.9730	0.9730	0.9708	0.9776	0.9849	0.9900	Dec 0.9954 (40)
HLP (average)												0.9874 (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												2.7308 (42)
Average daily hot water use (litres/day)												99.0576 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	108.9633	105.0010	101.0387	97.0764	93.1141	89.1518	89.1518	93.1141	97.0764	101.0387	105.0010	108.9633 (44)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Energy conte	161.5894	141.3272	145.8370	127.1442	121.9979	105.2749	97.5527	111.9431	113.2801	132.0170	144.1069	156.4907 (45)
Energy content (annual)										Total =	Sum (45)m =	1558.5611 (45)
Distribution loss (46)m = 0.15 x (45)m												
	24.2384	21.1991	21.8755	19.0716	18.2997	15.7912	14.6329	16.7915	16.9920	19.8026	21.6160	23.4736 (46)
Water storage loss:												
Total storage loss												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	50.9589	46.0274	50.9589	47.8733	47.4499	43.9653	45.4308	47.4499	47.8733	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month												
	212.5483	187.3546	196.7959	175.0175	169.4478	149.2402	142.9835	159.3930	161.1534	182.9759	193.4220	207.4496 (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												
	212.5483	187.3546	196.7959	175.0175	169.4478	149.2402	142.9835	159.3930	161.1534	182.9759	193.4220	207.4496 (64)
Heat gains from water heating, kWh/month								Total per year (kWh/year) =	Sum (64)m =			2137.7816 (64)
	66.4682	58.4981	61.2305	54.2438	52.4268	45.9952	43.7940	49.0836	49.6339	56.6354	60.2443	64.7729 (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	136.5422	136.5422	136.5422	136.5422	136.5422	136.5422	136.5422	136.5422	136.5422	136.5422	136.5422	136.5422 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	26.0995	23.1813	18.8523	14.2724	10.6688	9.0071	9.7324	12.6506	16.9796	21.5595	25.1631	26.8249 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	254.8318	257.4762	250.8125	236.6263	218.7187	201.8881	190.6443	187.9999	194.6636	208.8498	226.7574	243.5880 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	36.6542	36.6542	36.6542	36.6542	36.6542	36.6542	36.6542	36.6542	36.6542	36.6542	36.6542	36.6542 (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)												
	-109.2338	-109.2338	-109.2338	-109.2338	-109.2338	-109.2338	-109.2338	-109.2338	-109.2338	-109.2338	-109.2338	-109.2338 (71)
Water heating gains (Table 5)												
	89.3390	87.0508	82.2991	75.3386	70.4661	63.8823	58.8628	65.9725	68.9360	76.1228	83.6726	87.0603 (72)
Total internal gains												
	437.2330	434.6710	418.9266	393.1999	366.8163	341.7401	326.2022	333.5857	347.5419	373.4948	402.5558	424.4359 (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				3.6000	10.6334	0.6300	0.7000	0.7700	11.6989 (74)			
South				5.7800	46.7521	0.6300	0.7000	0.7700	82.5849 (78)			
North				0.6400	16.1759	0.6300	0.7000	1.0000	4.1089 (82)			
Solar gains	98.3927	165.3917	224.4281	281.4729	323.0966	325.4629	311.7309	279.1244	243.4995	181.9035	117.3530	84.5789 (83)
Total gains	535.6257	600.0627	643.3547	674.6728	689.9129	667.2030	637.9332	612.7101	591.0414	555.3983	519.9088	509.0147 (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	68.9679	69.1714	69.3720	70.3302	70.5125	71.3733	71.3733	71.5351	71.0392	70.5125	70.1448	69.7645
alpha	5.5979	5.6114	5.6248	5.6887	5.7008	5.7582	5.7582	5.7690	5.7359	5.7008	5.6763	5.6510
util living area	0.9988	0.9975	0.9940	0.9820	0.9402	0.8167	0.6422	0.6876	0.8985	0.9852	0.9974	0.9991 (86)
MIT	19.8992	20.0233	20.2218	20.4909	20.7471	20.9294	20.9858	20.9793	20.8657	20.5430	20.1751	19.8800 (87)
Th 2	20.0776	20.0800	20.0825	20.0938	20.0960	20.1059	20.1059	20.1078	20.1021	20.0960	20.0917	20.0872 (88)
util rest of house	0.9984	0.9966	0.9918	0.9746	0.9133	0.7402	0.5233	0.5711	0.8444	0.9776	0.9963	0.9988 (89)
MIT 2	18.5961	18.7794	19.0706	19.4678	19.8252	20.0529	20.1000	20.0981	19.9842	19.5468	19.0101	18.5751 (90)
Living area fraction									fLA =	Living area / (4) =		0.2947 (91)
MIT	18.9802	19.1460	19.4099	19.7693	20.0969	20.3112	20.3610	20.3578	20.2440	19.8404	19.3534	18.9597 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9802	19.1460	19.4099	19.7693	20.0969	20.3112	20.3610	20.3578	20.2440	19.8404	19.3534	18.9597 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9977	0.9953	0.9895	0.9712	0.9134	0.7596	0.5587	0.6056	0.8544	0.9748	0.9951	0.9983 (94)
Useful gains	534.4059	597.2678	636.6164	655.2098	630.1324	506.7909	356.3890	371.0372	505.0007	541.3865	517.3648	508.1407 (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												
	1464.5615	1417.0639	1280.4435	1063.3675	819.3631	550.5760	362.5722	380.6775	595.0780	901.6730	1201.9482	1455.6793 (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												
	692.0358	550.9030	479.0074	293.8736	140.7876	0.0000	0.0000	0.0000	0.0000	268.0532	492.9001	704.9687 (98)
Space heating												3622.5293 (98)
Space heating per m2										(98) / (4) =		36.5617 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												93.4000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												3878.5110 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	692.0358	550.9030	479.0074	293.8736	140.7876	0.0000	0.0000	0.0000	0.0000	268.0532	492.9001	704.9687 (98)
Space heating efficiency (main heating system 1)	93.4000	93.4000	93.4000	93.4000	93.4000	0.0000	0.0000	0.0000	0.0000	93.4000	93.4000	93.4000 (210)
Space heating fuel (main heating system)	740.9377	589.8319	512.8558	314.6398	150.7362	0.0000	0.0000	0.0000	0.0000	286.9949	527.7303	754.7845 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating requirement	212.5483	187.3546	196.7959	175.0175	169.4478	149.2402	142.9835	159.3930	161.1534	182.9759	193.4220	207.4496 (64)
Efficiency of water heater (217)m	87.8050	87.6037	87.2059	86.3462	84.5888	80.3000	80.3000	80.3000	80.3000	86.0112	87.3053	80.3000 (216)
Fuel for water heating, kWh/month	242.0686	213.8660	225.6680	202.6927	200.3194	185.8533	178.0616	198.4969	200.6891	212.7351	221.5467	236.0422 (219)
Water heating fuel used												2518.0396 (219)
Annual totals kWh/year												
Space heating fuel - main system												3878.5110 (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)												460.9252 (232)
Total delivered energy for all uses												6932.4759 (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	3878.5110	0.2160	837.7584 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2518.0396	0.2160	543.8966 (264)
Space and water heating			1381.6549 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	460.9252	0.5190	239.2202 (268)
Total CO2, kg/m2/year			1659.8001 (272)
Emissions per m2 for space and water heating			13.9448 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4144 (272b)
Emissions per m2 for pumps and fans			0.3929 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.9448 * 1.00) + 2.4144 + 0.3929, rounded to 2 d.p.			16.7500 (273)